MINUTES OF THE 21st CEOS PLENARY MEETING

13th-14th November 2007
Hawaii

FINAL

1 Welcome and Opening Remarks

The Chair, Barbara Ryan, opened the meeting and welcomed participants to the 21st CEOS Plenary. Welcomes and good wishes for the meeting were added by Andy Levin (host county mayor's office), Lynn Scarlett (Deputy Secretary of the Interior, USA) and Mark Myers (USGS Director).

Mr. Levin greeted meeting participants on behalf of the Mayor of the Big Island of Hawaii. He described the role that U.S. and international facilities on the Big Island play in supporting a wide variety of space, scientific and environmental research activities. He noted that the Big Island thus provides an excellent venue for international meetings on global science and technology issues.

Deputy Secretary of the Interior P. Lynn Scarlett welcomed meeting participants and emphasised the importance of timely, accurate, and continuous satellite data in the execution of the Department of the Interior's multifaceted mission. The Department directly manages one-fifth of all U.S. territory, with responsibilities relating to national parks, national wildlife refuges, Native American affairs, endangered species, resource management, and environmental conservation. Earth observation data are essential to U.S. economic and environmental decision-making, a fact underscored by the recent establishment of the U.S. National Land Imaging Program, and by the Secretary of Interior's leadership of the U.S. delegation to the upcoming Group on Earth Observation (GEO) Ministerial Summit in Cape Town, South Africa.

USGS Director Mark Myers also welcomed participants, and explained the USGS role as the "science arm" of the Department of the Interior, providing definitive analyses of Earth system processes and critical monitoring and warning services to the public. USGS maintains a broad scope of research activities and long-term data sets relating to natural hazards, water resources, ecosystem and resource management, and geospatial products and services. Earth observation data play an essential role in the USGS Science Strategy, which includes six strategic directions: 1) ensuring the Nation's economic and environmental future by understanding ecosystems and predicting ecosystem change; 2) clarifying the record of climate variability and change, and assessing its consequences; 3) providing a scientific foundation for natural resource security, environmental health, economic vitality, and land management; 4) assessing national hazards, their risk, and human resilience; 5) identifying environmental risks to public health, and, 6) quantifying, forecasting, and securing freshwater for the future.

Today USGS recognizes the need to more closely integrate its scientific findings with socio-economic decision-making. This "connectedness" is at the heart of the GEO "System of Systems" approach and the reason for USGS's major involvement in CEOS and GEO. International partnerships are therefore a cornerstone of the CEOS and GEO Work Plans, and have USGS's full and enthusiastic support.

Barbara Ryan (CEOS Chair) thanked the Deputy Secretary and the USGS Director for their participation and their strong support of USGS's CEOS Chairmanship. She noted that USGS has

been very pleased to chair CEOS, and that she looks forward to continuing and enhancing USGS partnerships with CEOS members in the coming years.

The proposed agenda for the meeting was adopted.

2 Earth Observation Mission Cooperation

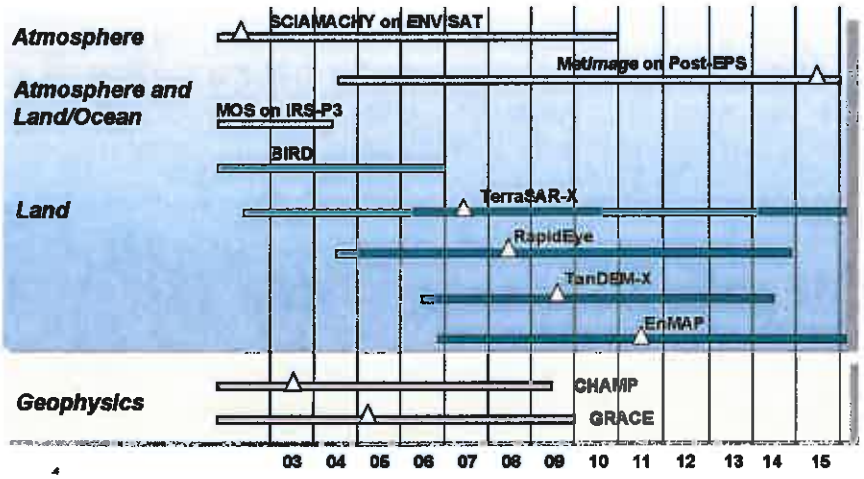
Alex Held of CSIRO presented the Australian contribution to GEOSS, as a perspective from a non-space faring nation, but a nation which is active on exploitation of space-based observations:

- With its economic oceanic areas and Antarctic territories, Australia manages around 1/8th of the Earth's surface;
- Australia has access to a multiplicity of satellite and airborne measurements – estimated at around 20TB of raw data down-linked monthly;
- As users rather than providers of space-based EO information, Australia provides expertise in development of applications towards key societal benefit areas; as well as calibration and validation of various partner country payloads using well instrumented and characterised sites;
- Various government departments have formal engagement with GEO activities, coordination being supplied by a federal GEO Inter-Departmental Committee (IDC).

3 Earth Observation Mission Development

Klaus Schmidt of DLR reported on the German Space Programme contributions to CEOS, GMES, and GEOSS:

- German EO strategy has the context of the European EO programmes involving ESA, EUMETSAT and the EU;
- The timing of the EO missions was shown as follows:



- TerraSAR-X was launched on 15th June 2007 and is working well to support both scientific and commercial applications, including in support of Disaster Charter needs on occasion;

- The RapidEye constellation is a commercial venture for agriculture, disasters and ecosystems;
- TanDEM-X SAR interferometry mission will be launched in 2009 and will provide precision digital elevation models;
- EnMAP will provide hyperspectral observations on a wide range of ecosystem parameters from 2011;
- DLR hopes to see more public-private partnerships in the future to enhance the national capabilities in addition to Germany's role within European-level programmes.

Barbara Ryan thanked Messrs. Held and Schmidt for their presentations, and remarked how they were two excellent examples of the comprehensive and end-to-end nature of the CEOS Membership: the first maximising the use of funding for ground-based assets, and the second highlighting the wide variety of satellite data available to users worldwide.

4 Visualization Demonstration: Virtual Constellations for GEO

Plenary was shown the 14-minute video presentation which featured applications and benefits of all 4 pilot Constellation studies. Barbara Ryan thanked all involved in the development of the Constellations video – including Constellation leads, NASA staff, and Tim Stryker of USGS.

5 Report from the Chair: Accomplishments & Challenges

Barbara Ryan summarised the USGS efforts in 2007 as CEOS Chair:

- USGS has sought to broaden Members' commitment and energy;
- The CEOS Executive Officer role has been instrumental in strengthening the relationship with GEO and ought to be continued;
- On the Constellations, much remains to be done including suitable access to the data to realise the potential benefits; the Systems Engineering Office is a potentially valuable resource in helping CEOS address technical issues of the Constellations; and,
- CEOS may have to consider a dedicated secretariat in the future to provide the capacity and sustained effort required to deliver the space segment of GEOSS;

Much work remains to be done and USGS is pleased to have provided a significant contribution as Chair in 2007. Space-based observations will continue to be the main source of information for most of the GEO societal benefit areas and CEOS needs to step up to provide the coordination required to deliver the coverage and continuity needed. Mary Kicza, on behalf of all CEOS agencies, thanked Barbara and her USGS team for their energy and achievements in 2007.

6 Organizational and Membership Matters

CDTI (Spain)

Barbara Ryan (Chair) noted the application of the Centre for the Development of Industrial Technology (CDTI) of Spain to become a Member of CEOS.

Mónica López (CDTI) gave a short presentation summarising CDTI and its programmes. CDTI manages public programs aimed at promoting R&D among Spanish industries, including space activities. CDTI is the focal point for the Spanish space industry. As the Spanish Delegation to ESA, CDTI manages the core of the national budget for space and provides coordination for other space initiatives where Spain is involved.

Spain's optical Earth observation system is called INGENIO and has a range of applications such as: cartography, land use, urban management, agriculture and forestry mapping, water management, environmental monitoring, risk management and security. The payload has a resolution of 2.5m PAN and 10m MS. Launch is expected in 2010.

Volker Liebig (ESA) suggested that - based on the information presented by CDTI - the agency fulfils the requirements for membership as defined in the CEOS Terms of Reference (see below) and should be accepted as a CEOS Member.

"Governmental organizations that are international or national in nature and are responsible for a civil spaceborne Earth observation program currently operating, or at least in Phase B or equivalent of system development, will be eligible for membership in CEOS. Members must have a continuing activity in spaceborne Earth observation, intended to operate and provide nondiscriminatory and full access to data that will be made available to the international community. The addition of Members will be with the consensus of current Members of CEOS. Request for membership should be addressed to the Chairperson of the next scheduled CEOS Plenary session. The Members at that meeting will consider such requests."

Lars Prahm (EUMETSAT) seconded this proposal, noting that Spain is an active member in EUMETSAT programmes. Paula Freedman (BNSC) also voiced support for CDTI admission to CEOS and hoped that CDTI could be found a task to embed them soon within CEOS activities.

Barbara Ryan noted the endorsement of the meeting for CDTI's application and welcomed CDTI to participate in the remainder of the 21st Plenary meeting as the newest Member of CEOS.

CRESDA (China)

Gilberto Camara (INPE) noted the application of CRESDA (China Center for Resources Satellite Data and Application) to join CEOS as a Member.

CRESDA was formally established in October 1991 with approval of Ministry of Personnel Affairs. The title of CRESDA was also named and inscribed by the former Prime Minister Li Peng. It is a national, governmental scientific research and operation institution under the supervision of State Development and Reform Committee and Commission of Science, Technology and Industry for National Defense. China Aerospace Science and Technology Corporation (CASC) is responsible for the administrative management of CRESDA. CRESDA is a national center for land observation satellite data processing, storage and distribution. With the rapid development of China's space industry, CRESDA has been growing steadily in the past 15 years. CRESDA is the legal owner of the CBERS-1 & 2 satellites and therefore responsible for CBERS routine operational management. To date, millions of image scenes from CBERS-1 and CBERS-2 data have been collected and stored in CRESDA's Image Library.

Chu Ishida (JAXA) confirmed that his review of the CRESDA application on behalf of CEOS SEC showed that it meets the criteria required for CEOS Membership.

Barbara Ryan noted the endorsement of the meeting for CRESDA's application and welcomed CRESDA in absentia as the newest Member of CEOS.

Action	21-1	**CEOS Chair to send letters confirming CDTI and CRESDA as the newest Members of CEOS**	**Dec 2007**

7 Coordination of Open Action Items from 20th Plenary

Stephen Ward noted that the final version of the 20th Plenary minutes had been distributed by CONAE, incorporating all comments received. He summarised the status of the 20th Plenary actions, most of which had either been completed or were specifically being addressed in connection with 21st Plenary agenda items.

No.	Action	Due Date / Status
20-1	**CEOS Chair to convey the acceptance and appreciation of CEOS in a letter to GISTDA in response to their offer to serve as CEOS Chair agency in 2008-9**	**COMPLETE**
20-2	**CEOS agencies to provide any comments to SIT Chair on the outline of the CEOS Implementation Plan for Space-observations for GEOSS**	**COMPLETE**
20-3	**CEOS agencies to provide any comments to SIT Chair on the draft Constellations Process Paper**	**COMPLETE**
20-4	**SIT Chair to confirm senior SIT Liaisons proposed to help mentor Constellation Study teams**	**COMPLETE – OVERTAKEN BY EVENTS**
20-5	**SIT Chair, assisted by SIT Liaisons, and in consultation with relevant Principals, to work with Constellation Study Leads to define the inter-agency agreements required as the basis for each Constellation – and to scope an outline timetable for their execution**	**SEE CONSTELLATION STUDY REPORTS**
20-6	**SIT Chair, in consultation with CEOS Chair, and supported by the IP Task Force, to develop a Work Plan for further development of the Implementation Plan in 2007 – including results for the GEO Summit and encompassing the Constellations, Climate Chapter actions, etc.**	**COMPLETE 2007 Work Plan has guided CEOS SEC and Task Force work in 2007**
20-7	**JAXA to further develop the long-term targets for the GEOSS space segment analysis for integration into the CEOS Implementation Plan document**	**COMPLETE For discussion in item 8**
20-8	**ESA to write to CEOS Chair confirming their willingness to support the new post of CEOS Executive Secretary (or whatever title is ultimately decided by CEOS SEC) for the initial period of 2 years from 1st January 2007**	**COMPLETE Jean-Louis Fellous (ESA/CNES) has served as the CEO in 2007**
20-9	**CEOS Chair, supported by CEOS SEC, to review CEOS Terms of Reference and structure texts to consider whether revisions are necessary to reflect appointment of the new**	**COMPLETE Initial review conducted with no short-term need to modify**

	Executive Secretary position	documentation
20-10	CEOS Chair to report to Plenary 2007 on how effective the Executive Secretary position has been in achieving the envisaged goals	COMPLETE (Reported under Item 5)
20-11	CEOS SEC agencies to consider USGS appeal for additional SEC manpower in 2007 to address the heavy workload resulting from the CEOS IP development and other activities	COMPLETE
20-12	CEOS Agencies invited to send to BNSC any comments they may have on the BNSC paper on engagement of the Commercial Sector in the CEOS IP. BNSC to pass on consolidated comments to the CEOS IP Task Force.	COMPLETE (To be reported under Item 20)
20-13	CEOS Agencies to review Version 3 of the GEO 2007-9 Work Plan, in advance of GEO-III and to send comments to Jean-Louis Fellous on their potential contributions to WP Tasks	COMPLETE
20-14	CEOS Chair, supported by CEOS SEC, to formulate a response to the recent communications from WCRP & GCOS	COMPLETE Sent 22 December 2006
20-15	Space frequency questionnaire will be updated annually. BNSC has offered to make the update for 2007 and agencies are urged to respond. Agencies are asked to provide relevant point of contact to BNSC. Agencies are encouraged to respond fully the questionnaire when next issued.	TO BE REPORTED ITEM 21
20-16	Radio Frequency issues to be added as a permanent item in the Plenary Agenda	COMPLETE
20-17	CEOS Members to forward any nominations for future WGISS Chair to Ivan Petiteville	COMPLETE ITEM 13
20-18	CEOS Agencies to consider reviewing (and increasing) the level of staff resources supplied to WGISS in light of the increased demands resulting from WGISS efforts in support of GEO activities	ITEM 13
20-19	CEOS Members to provide feedback on the WGISS proposal to organize an annual CEOS-level conference to address all issues related to space contribution to GEO with the participation of end-users, scientists, politics, commercial sector,	COMPLETE (To be reported under Item 13)

8 1st Annual Report on CEOS Implementation of GEOSS Space Segment

8.1 Overview

Volker Liebig (SIT Chair) stressed the importance of the discussion on the CEOS Implementation Plan (CEOS IP) – as the path chosen by CEOS in 2005 in response to the arrival of GEO and the

GEOSS. It aims to deliver the action-oriented agenda for Plenary which USGS has sought as Chair in 2007. He noted that this agenda item is the 1st implementation status report by the SIT Chair on the CEOS IP and that CEOS agencies have agreed that this becomes the main business of Plenary. The Plan is the basis for a more formal communication cycle annually with the GEO Secretariat.

Volker Liebig stressed that the CEOS IP was target-driven, since the targets are what GEO Member Governments and Participating Organisations signed up to and the targets define the political mandate that drives contributions to the GEOSS. A JAXA-led analysis of the GEOSS Reference Document identified 79 different 'space segment targets' (2, 6, & 10 year horizons) for realisation of the GEOSS across all SBAs, plus a further 16 cross-cutting GEO WP tasks related to Architecture, Data Management, and Capacity Building ambitions of GEOSS where CEOS is active - especially in the Working Groups.

It was explained that the 2007 efforts represent a significant investment in a logical and comprehensive framework for management and reporting of all future CEOS efforts For each and every of the 79 targets, the Task Force has:

- Identified supporting GEO WP tasks (Director's Note to the GEO WP);
- Identified CEOS role and relevant contacts;
- Assessed current progress towards target;
- Identified issues and obstacles;
- Summarised plans and priorities for 2008 and beyond.

Stephen Ward introduced sample content from the IP, explaining that this first edition is incomplete and immature but that the IP should be considered a living document for annual update. Subsequent versions will refine targets and tasks in coordination with GEOSEC. It was noted that the following SBA presentations make reference to CEOS SBA coordinators nominated to improve CEOS-focused oversight and reporting of the various tasks within each of the GEO SBAs and cross-cutting activities. Plenary agreed to the adoption of these roles to help improve the IP in 2008.

Action	**21-2**	**SIT Chair and CEOS Exec Officer to confirm volunteers for CEOS SBA Coordinator roles and to establish their function in the CEOS IP update and management in 2008**	**CEOS-22**

8.2 2007 Progress Review

GEO WP Task Highlights

Jean-Louis Fellous (CEO) reported:

- Amongst the various GEO Tasks where CEOS participation has been identified, the CEOS member (or WG) role goes from "Contributing Organization", through to "co-Lead" or "Lead" and "Point of contact";
- Information on Task progress is gathered by the Lead and Point of contact for each Task and summarized in "Task sheets" released every four months—with the CEO to track that these reports are being made through the Task Leaders to the GEO Secretariat;

- Actions where CEOS is **Lead and Point of contact** generally show good progress;
- The situation is diverse in other tasks wherein CEOS acts as a Contributing Organization, with some areas showing significant progress and other areas where "no progress has been reported since last update" (*but this may not represent the actual evolution*);
- **Overall, the CEOS contribution to GEO Work Plan appears broadly satisfactory, but is in urgent need of additional contributions by involving additional agencies.**

Action	**21-3**	**CEOS contact persons for all GEO WP tasks encouraged to regularly report progress through their Task Leaders in 2008 with tracking of this process by the CEO**	**CEOS-22**

Disasters SBA

Stephen Ward reported on 2007 progress:

- Several improvements in the operation of the 'International Charter – Space and Major Disasters' have been implemented in 2007;
- Geohazards, terrain deformation and volcano monitoring workshops have more precisely defined requirements for observations and further investigated the potential for upcoming missions to contribute to disaster monitoring;
- The IGOS Geohazards theme requirements were revised and formally updated;
- A workshop elucidating the proposed DESDynL mission including both interferometric SAR and LIDAR for terrain deformation mapping was held in June 2007;
- GEOSEC has written to Charter parties requesting access to Charter facilities on behalf of all GEO Member States, to be considered by the Board of the Charter parties;
- DI-06-09 (CEOS LEAD) is making good progress on a study of critical observations continuity: proposed a Disasters Virtual Constellation Study by CEOS from 2008;
- Integrated INSAR and GPS (110b) efforts need alignment and target redefinition;
- No obvious lead on Lidar/INSAR topography (108) or Automated processing systems for rapid hazard detection (111).

And on 2008 actions:

- An ongoing effort is needed to ensure the IGOS Geohazards team successfully absorbed into the GEOSS requirements analysis. A more integrated approach is to be investigated among agencies with current and proposed relevant missions, particularly in the field of InSAR including a 2008 workshop (action CSA - DI-06-09 context);
- Explore high vertical resolution (less than 1 metre) topographic data to be made available, plus good shallow-water bathymetry (action CSA - DI-06-09 context);
- Automated processing for hazards (fire monitoring/oil spill) - investigate how to broaden ongoing initiatives towards target 111 in terms of coverage, user community and data interoperability (action: Disasters SBA Coordinator);

- CEOS will consider a proposal for a new study for a Virtual Constellation for Disasters, to be studied by CEOS in 2008 in the context of the GEOSS Space Segment priorities (action: SIT Chair + GEOSEC + Disasters SBA Coordinator);
- **Guy Seguin (CSA) has volunteered to serve as the first Disasters SBA Coordinator.**

Gilbert Camara (INPE) asked about SRTM dataset access, and Mike Rast (GEOSEC) clarified that the reporting is not up to date and an announcement will be made at GEO Summit. 30m DEM data will be available – as joint effort of US and Japan/METI using ASTER data. Preparatory letters are being signed and it will be identified at GEO Summit as a major contribution to GEO.

Health SBA

Changyong Cao reported on 2007 progress:

- Habitat monitoring for infectious disease prediction: Early study by Beck et al, 2002. Additional sensors from several space agencies are contributing to this area of research. Vegetation Health Index maps produced at NOAA provide valuable data on early detection of mosquito habitat and subsequent spread of diseases, e.g. malaria;
- Greenhouse gas maps being produced from a number of satellites: Collaborative effort (NASA, NOAA) using the Atmospheric Infrared Sounder (AIRS) has produced a 5 year record of daily/weekly/monthly maps of CO2, CH4 , CO, O3, and water vapour;
- Volcanic ash advisory for aircraft operations for global predictions using combined US and European assets: Products are being operationally used (NASA, ESA, and operational agencies);
- Smoke forecast tool deployed into operations at NOAA, after successful experimental testing: Used by the U.S. National Weather Service to provide air quality advisories to the public. Advanced warnings are expected to minimize health risks;
- Workshop on the contributions of land remote sensing to human welfare conditions was held at the U.S. National Academy of Science (NAS): Report available on the NAS website;
- Improve access to historical RS data for health applications (2 yr target): Time series from NOAA AVHRR is now available; Remote sensing data available from CEOS agencies data archive centres;

2008 plans include:

- Projects already in progress:
  - Advanced nitrogen dioxide (NO2) product using data from both GOME-2/Metop and OMI/Aura;
  - A high quality enhanced global tropospheric ozone climatology employing multiple data sets;
  - Prepare for greenhouse gas products from GOSAT (JAXA).
- Provide status report on "Wide-area health parameters from satellites";
- Hold meeting to discuss "Specifications for new major observation capabilities from space";

- Continue working on habitat monitoring and disease prediction: Using AVHRR and the EUMETSAT SEVIRI geostationary imager to assist in combating diseases such as Malaria;
- Near real-time distribution of a series of atmospheric composition products (to be selected based on availability, quality and functionality) through AC constellation: A user workshop will be held to define data enhancements and distribution;
- **Antonio Guell (CNES) has volunteered to serve as the first Health SBA Coordinator (confirmed by Pascale Ultre-Guerard).**

Energy SBA

Brian Killough (NASA) reported on 2007 progress:

- Strategic plan: The strategic plan has been finalized by the Energy Community of Practice and is being submitted to GEO Cape Town;
- Evaluation and revision of strategic plan: Implementation of elements of the Strategic Plan is already proceeding;
- New energy-tailored products and services: GEO Near-Term Demonstration Project, "Solar Energy Data for Developing Countries" was initiated with international collaboration. Other pilot and demonstration projects underway, funded by national and regional agencies e.g., European ENVISOLAR project & NASA Applied Sciences Program (to inform decision making in the Energy sector);
- A US national assessment of energy-related Earth observations, models, and decision support systems, together with a stakeholder's engagement workshop to assess the applicability of Earth observations and models to end-user needs has been conducted by NASA during 2007.

And on 2008 plans:

- *The Strategic Plan for "Improving Management of Energy Resources" describes goals of GEO members, supporting activities, and recommended future actions. These align with GEO 2007-2009 work plan tasks – EN-07-01, EN-07-02, and EN-07-03. Activities at national level are presently occurring in these areas with pilot and demonstration projects conducted by Energy CoP member organizations;*
- As recommended in Strategic Plan, analyses of nation's space-borne measurement & modelling assets & decision support systems relevant to energy community should be performed by other nations (US has undertaken this). Action: China (NRSCC), Europe (ESA), India (ISRO), Japan (JAXA), Russia (ROSHYDROMET), South Africa (SAC), and other interested nations or regions;
- Further stakeholders workshops involving scientists & public/private sector end-users, to communicate availability of space-borne measurements relevant to energy community & to better understand user requirements, are encouraged (action: Energy SBA coordinator to investigate);
- Long-term commitments to GEOSS & CEOS objectives need to be articulated by national/regional agencies to ensure continuing progress in GEO work plan goals. Non-traditional funding sources, for example from the private sector, should be explored, as appropriate (action: Energy SBA coordinator to investigate);

- **Richard Eckman (NASA) has agreed to serve as Energy SBA Coordinator.**

Climate SBA (CEOS Response to the GCOS IP)

Jean-Louis Fellous (CEO) reported:

- CEOS Response to GCOS Implementation Plan Satellite Supplement was prepared and presented to UNFCCC COP-12 in November 2006 in Nairobi;
- CEOS Response to GCOS-IP = GEO Task CL-06-02;
- The CEOS Response includes 59 actions covering the Atmosphere (A), Ocean (O) and Terrestrial (T) domains, and a number of Cross-cutting issues (C);
- CEOS and GCOS have jointly defined lists of 1st, 2nd and 3rd priority actions, based on an evaluation of their ability to deliver significant results in the short (1-2yr), medium (4-6yr) and long term (~10yr);
- Most Cross-cutting actions are "permanent", long-standing efforts (e.g., adherence to GCOS Monitoring Principles);
- By request of CEOS Chair in February 2007, most agencies have designated a Climate Focal Point, "*a person empowered with the time, resources and decision-making authority*", charged with the responsibility to identify appropriate actionees and to monitor progress of climate actions within their agency;
- Climate Focal Points have been designated by BNSC, CNES, CSA, DLR, EC/JRC, ESA, EUMETSAT, INPE, JAXA, NASA, NOAA, NSC, USGS, as well as by FAO and WCRP.

Action	**21-4**	**CEOS agencies which have not yet designated a climate actions focal point to provide the contact information to the CEOS Executive Officer and Climate SBA coordinator Mitch Goldberg (NOAA)**	**January 2008**

- All 1st Priority actions have been assigned to an "Action Team", with a Team Leader – action plans are being defined and reporting processes initiated;

Initial results on these actions were summarised:

- Investigations of cloud properties and cloud trends from combined satellite imager plus sounder measurements (action A-3) is underway with contributions by NASA, NOAA, EUMETSAT, CNES, DLR and CSA;
- Plans toward a Global Precipitation Mission (A-4) are rapidly developing with contributions by NASA, NOAA, JAXA, CNES and ISRO – See Precipitation Constellation Report;
- NOAA and NASA announced on April 11, 2007, a plan to restore OMPS to NPOESS Preparatory Program (A-8), with the OMPS Ozone Limb returned to the NPP satellite set for launch in 2009;
- Operational production of consistent sea ice data sets (O-2) is underway with contributions by EUMETSAT, NOAA, ESA and NSC;

- EUMETSAT, NOAA and CNES exchanged letters expressing interest for a Jason follow-on mission; detailed design of ESA's Sentinel-3 (carrying an altimeter) has started (O-4);
- CNES and ISRO have signed in February 2007 an MoU for the launch of the SARAL mission, and SOA (China) has confirmed the launch of HY-2, all carrying an altimeter payload (O-5);
- Considerable progress is being made in establishing agreements enhancing cooperation among international space agencies that currently operate mid-resolution land-surface imaging systems, including cooperation to fill gaps in the Landsat data record (T-1);
- Active work is performed by NOAA, EUMETSAT, NSC, DLR and CCRS to enhance the quality of the FCDRs and the ECVs generated from the AVHRR record (T-4);
- ESA has produced a report on the compliance of its Sentinel satellite program with GCOS Climate Monitoring Principles (C-4).

Jean-Louis Fellous proposed a number of priorities for 2008:

- Getting all 1st priority actions up to speed, and obtaining involvement of all CEOS agencies in their fulfillment; particular efforts to reaching out to space agencies not currently contributing to space-based climate observations, and work at getting active participation;
- Initiating 2nd (and in some cases 3rd) priority actions through assembling action teams;
- Enhancing the collaboration of all space agencies into cross-cutting actions;
- Climate-C-1: "*CEOS will review the prevailing institutional arrangements in place for the planning and implementation of cooperative efforts by space agencies in the domain of Climate by 2007…*"; did not progress as anticipated in 2007 and should be given attention in 2008 Action: NOAA as SIT Chair;
- Climate-C-4: "*Adequate adherence to the GCMPs*" was presented by ESA at SIT-20 but has not progressed in 2007. This should be promoted in 2008, including in relation to implementation actions for the prototype Constellations (as targeted in action Climate-C-6). Action: CSIR as CEOS Chair;
- Climate-C-16: *"Consider, in context of Constellations, ways to support transfer of demonstrated observations from research satellites into operational capabilities. In particular, CEOS will encourage "convergence" of climate-observing requirements (usually for high-quality data) with operational requirements (usually for rapid and ensured data availability), and support institutional arrangements that would help transfer ECVs from research to operations."* Action: NOAA as SIT Chair;
- Climate-C-20: *"CEOS agencies will endeavor to ensure global, easy, and timely access to climate-related products, including by developing countries."* It is proposed that this action be championed by GISTDA as incoming Chair in 2008 and by EUMETSAT, supported by CEOS, SIT, and WGEdu Chairs, as part of a broader initiative towards GEO 2-year target #29 (Improve the reporting of observations to international data and analysis centers in terms of data volumes, quality and timeliness) and in relation with the R/SSC-CM initiative. Action: GISTDA, EUMETSAT, CEOS/SIT/WGEdu Chairs;
- Climate-C-21: *"CEOS will establish a program in 2007 to document the data archive and access arrangements in place for each of the FCDRs contributed by space agencies. WGISS*

will lead this effort in 2008 in order to evaluate practical solutions to current obstacles and issues." Action: WGISS in consultation with GCOS;

- **Mitch Goldberg (NOAA) has volunteered to serve as the first Climate SBA Coordinator.**

Klaus Schmidt (DLR) noted that SCIAMACHY (on ENVISAT) is in full compliance with the GCOS Climate Monitoring Principles and that DLR plans to apply the GCMPs to future missions as far as possible and will provide a written statement to CEOS Chair following Plenary to this effect.

Action	**21-5**	**DLR to provide CEOS Chair with a letter regarding adherence of their planned EO missions to the GCOS Climate Monitoring Principles**	**January 2008**

Paul Mason (GCOS) expressed thanks to Jean-Louis Fellous for taking forward the climate actions and to agencies for tolerating the met agencies and research agencies coordination issues. GCOS is very appreciative.

Water SBA

Chu Ishida (JAXA) reported:

- SMOS (2008) and GPM (2013) are making steady progress toward their launches;
- ESA's altimetry mission, WatER, has had the setback of not being selected as an Earth Explorer core mission;
- For water quality monitoring, a GEOSS workshop on inland and coastal water quality monitoring was held. Prospects for implementing water quantity and quality monitoring systems not certain, though potential has been identified;
- The GRACE mission demonstrated potential for locating large-scale water distribution;
- Integrated precipitation products with multi-satellite data have been realized by the TRMM 3B42 multi-satellite product;
- Coordinated Enhanced Observation Period (CEOP) made a major leap to the Coordinated Energy and Water Cycle Observation Project by covering 7 Regional Hydrological Projects (RHPs). CEOP is constructing a prototype for satellite data integration with in-situ data and NWP model outputs;
- The Asian Water Cycle Initiative (AWCI) is developing its implementation plan which covers data integration and capacity building for the Asian region.

And on 2008 priorities:

- The CEOS Precipitation Constellation (DA-07-03) could further expand the original GPM concept, incorporating new missions and instruments. CEOS space agencies should support the CEOS Precipitation Constellation (action: CEOS Members with supporting precipitation payload plans);

- Exploration to initiate new missions for water quantity (WA-07-02) and water quality (WA-07-01) should be continued. A new task should be established in support of 6-year target #142 for development of new products for precipitation, soil moisture, evaporation, evapotranspiration & other water cycle variables (action: Precipitation Constellation team);
- The IGWCO should continue to play a key role for coordinating all the relevant programs for water cycle research and applications in support of GEOSS;
- CEOS space agencies should support the challenge of CEOP's integration of 7 RHPs by providing satellite data and supporting the data integration (action: lead and coordination JAXA). The Asian Water Cycle Initiative (AWCI) should be implemented with support from CEOS space agencies;
- The CEOS TIGER project will contribute to the GEO Task WA-06-07 "Integrated Earth Observation Water Resource Management" (a report on TIGER is available on the CEOS Plenary documents page);
- **Chu Ishida (JAXA) has volunteered to serve as the first Water SBA Coordinator.**

Weather SBA

Jerome Lafeuille (WMO) reported on 2007 progress, noting that many of the Weather-related actions were also supporting the Climate SBA:

- The joint WMO-CGMS response to GCOS IP was forwarded to CEOS;
- A workshop on re-design of the WMO GOS was held in June with CEOS participation;
- Draft "Vision for the GOS to 2025" was presented at CGMS-35 in November;
- Global Space-based Inter-Calibration System (GSICS) builds on CEOS WGCV and ISCCP/SCC heritage and involves 7 operational or R&D space agencies and WMO, with NOAA lead; cross-calibrating IR broadband to hyperspectral references (AIRS, IASI); GSICS is operational for LEO satellites and under development for Geostationary satellites;
- R&D and demonstration missions:
    - Wind profile: ESA progress on ADM-Aeolus for launch in 2009
    - Precipitation: progress on GPM plans and partnership but delay to 2013
    - Soil moisture: ESA progress on SMOS for 2008
    - Geo hyperspectral IR sounding: CMA & EUMETSAT plans for 2014-2016 timeframe but IGeoLab demonstration mission still undecided
    - HEO (Molniya orbit) IGeoLab proposed cooperation based on Arctica project
- Regional/Specialized Satellite Centres (R/SSC) provide a global network of centres delivering quality-controlled global satellite products; R/SSC-CM is dedicated to Climate Monitoring and will generate GCOS ECV products; an Implementation Plan was submitted to a potential participants' meeting on 9 November; GCOS, CEOS, CGMS, WMO will guide the R/SSC-CM through an Executive Panel.

And on 2008 priorities:

- Finalizing the vision for the space-based GOS - to be submitted to the WMO CBS in November 2008; will refine 'R&D to operations' transition strategy and WMO supporting role;

- Support implementation efforts, including: Hyperspectral sensors on geostationary satellites; advanced sounding on early morning orbit; continuity of altimetry, ERB missions; GPM constellation implementation;
- Further GSICS implementation: Routine cross-calibration of LEO and GEO operational IR sensors; Visible sensors, MW sensors (GSICS support to GPM MW sensor calibration).
- **Paul Counet (EUMETSAT) has provisionally volunteered to serve as the first Weather SBA Coordinator.**

Ecosystems SBA

Alex Fortescue (CSIR) reported on 2007 progress:

- Significant progress has been made towards the implementation of the IGOS Carbon Observing System (target 59);
- Coordination frameworks have been established for target 61 – continuity of moderate and high-resolution EO satellites for land cover and ocean colour – through development of the CEOS Land Surface Imaging Constellation;
- WGCV is indicated as CEOS contact for the WP tasks supporting many of the other targets – this needs to be verified/corrected in 2008 as part of improved coordination and management of CEOS efforts for the ecosystem SBA.

2008 priorities are:

- A number of actions are proposed in support of the Global Carbon Observing System:
  - Development and implementation of a strategic plan for global carbon monoxide, carbon dioxide, and methane satellite observations combining existing measurements (MOPPITT, AIRS, SCHIAMACHY, IASI) with OCO and GOSAT, including coordination of calibration and validation network (action: actionee TBD);
  - Continuity and expansion of coordinated *in situ* and satellite observations over ocean through IOCCP (action: actionee TBD);
  - Expansion of fluxnet network to give better geographical and land cover coverage and its coordination with cal-val networks in support of satellite land surface observations (action: WGCV LPV);
  - Rigorous sensitivity analyses for global land surface products from satellites (LAI, phenology, fAPAR, burned area) (action: actionee TBD).
- Investigation into prospects for an overarching body to implement the Global Carbon Observatory with responsibility to improve coordination among existing programmes and components, particularly GCP, TCO, IOCCP, IGCO and GEO, to coordinate and improve links between the carbon cycle research community and the traditional weather forecasting centres and facilitate communication between *in situ* & remote sensing communities (action: actionee TBD);
- In support of observation continuity, the CEOS LSI Constellation will complete definition of preliminary standards for future mid-resolution LSI systems and refine and expand preliminary mid-resolution LSI system standards (action: LSI Constellation).

- **Alex Fortescue (CSIR) has provisionally volunteered to serve as the first Ecosystems SBA Coordinator.**

Agriculture SBA

Tim Stryker (USGS) reported on 2007 progress:

- Progress during 2007 largely user-driven from international mechanisms such as GOFC/GOLD, and IGOL. There was considerable progress from user communities toward several targets – e.g., creation of first-generation global irrigated lands database by International Water Management Institute and ongoing monitoring of at-risk areas by the multi-national, multi-agency Famine Early Warning System;
- Each of these efforts is heavily reliant upon space-based Earth observations and is dependent upon their long-term continuity. LSI Constellation continuity efforts directly address the needs for the Agriculture SBA;
- IGOL convened workshops in 2006 and 2007 that addressed the GEOSS Agriculture SBA targets. The 2007 workshop report will outline recommendations pertinent to the space segment of GEOSS - including statements of support for long-term high resolution data continuity.

2008 priorities are:

- Priority tasks for CEOS are those supporting long-term moderate resolution (eg, 10 to 100 metres) satellite data continuity. LSI Constellation is largely addressing the continuity issue, but continued emphasis is necessary;
- Moderate resolution continuity is currently a Priority 2 Action for the CEOS response to the GCOS-IP. This could be elevated to a Priority 1 Action and more actively address several of the GEOSS Agriculture SBA targets (69, 74, 171, 174). Several CEOS agencies are already addressing this issue and could make substantial progress in the near-term (EUMETSAT, NASA, USGS, NOAA, CSA). In the first instance the LSI Constellation might investigate and propose a way forward to cover the necessary ground (action: LSI Constellation Team);
- CEOS representation to the relevant IGOL and GOFC/GOLD workshops is necessary in 2008 to maintain awareness of evolving user needs and of progress towards them. Such representation could be directed by the proposed Agriculture SBA coordinator for CEOS (action: Agriculture SBA coordinator).
- **Brad Reed (USGS) is willing to serve as Agriculture SBA Coordinator.**

Biodiversity SBA – no space segment targets have been identified to date.

Cross-cutting activities

Ivan Petiteville (ESA & ADC Co-Chair) reported on 2007 progress:

- Activities in 2007 focused on improving data access and data sharing, advancing the development of interoperability among systems through international standards, developing mechanisms for the sharing and use of data and information products, and developing

detailed specifications and demonstrations of the underlying architecture and user-interface components of the 'System of Systems';

- GEO is enabling users to locate, access, and share data, information, services and applications through a clearinghouse and Web portal. Inter-operability arrangements, such as the GEOSS component and service registration, the standards registry, and a forum to achieve consensus inter-operability arrangements serve the GEOSS community significantly in addressing issues under each Societal Benefit Area;
- Several GEO Tasks have progressed significantly in 2007. Very different aspects of GEOSS have been addressed such as data policy, GEOSS architecture, interoperability standards, protection of radio frequencies etc;
- There are significant efforts for design and implementation of GEOSS Core Components (GEOSS Registries, GEOSS Clearinghouse and GEO Web Portal). Approximately 50 GEOSS components have been registered (a third of these by CEOS);
- CEOS has been very active in the cross-cutting activities and in particular in the Core Architecture Tasks aiming at designing and implementing the GEOSS Core Components;
- Following a request from the GEO Secretariat Director (CEOS Plenary 20), a new WGISS Task Team has been set up to deal with Sensor Web related-matters. The WGISS Task Team Leader is also the Point of Contact, leading the corresponding GEO task (DA-07-04) to ensure the maximum synergy and efficiency between CEOS and GEO;
- Data Sharing Principles have been drafted but several iterations will be needed before finding a general agreement within the GEO Community.

2008 priorities are:

- The Radio Frequency issue (AR-06-11) will require a continuous effort to increase the awareness of the competent authorities and to maintain the pressure and lobbying at the right level (action: ESA – Edoardo Marelli);
- Both CEOS WGISS (ICS Catalog Task Team led by ESA, Archive Task Team led by JAXA and Data Services Task Team led by USGS) and CEOS Members that host data catalogues, data archives and other information servers have to follow closely the recommendations made by the AR-07-01 and AR-07-02 Task Teams for interoperability matters (coordination action on WGISS). This concerns the majority of CEOS Agencies. It is expected that at least the following space data providers (CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS) allocate the necessary resources to the three WGISS Task Teams;
- The GEO Data Sharing Principles White Paper will be reviewed within CEOS (action: SIT Chair);
- DA-06-04 on "data, metadata and product harmonization" is expected to begin in earnest in 2008. CEOS Agencies having a long experience in the matter will have to participate actively either directly or via WGISS. At least CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS are requested to allocate some experts in 2008;
- CB-07-02 is linked to DI-06-09 (Risk management task led by Canada, China and UNOOSA). Progress has been slow for this CB-07-02 task led by CEOS. Additional resources are needed to ensure work undertaken by IGOS Geohazards team is successfully reflected. WGEdu, UNOOSA, UNESCO propose to accelerate progress in 2008.

- **Ivan Petiteville (incoming CEO) willing to serve as Cross-cutting Coordinator.**

Jim Yoder (IOCCG) noted that the data sharing principles (above) is the crux of the whole policy and central to CEOS success and role in GEO. Mike Rast (GEOSEC) confirmed the document is available on the GEO Plenary website. GEO is not reinventing the wheel but taking the best practices and principles available and assembled by ICSU/CODATA. Mike stressed the importance of its consideration by CEOS agencies and suggested that once principles are on board it is peer pressure which will determine its success. Space agencies are encouraged to provide feedback through CEOS to GEOSEC.

8.3 Way Forward on the CEOS IP

Ivan Petiteville (incoming CEO) summarised the messages on the way forward:

- CEOS should utilise the CEOS IP as the foundation and framework for managing and monitoring progress against targets and tasks – with oversight by SIT Chair;
- Given the volume of work, CEOS should establish below SIT, small expert teams (each under a CEOS SBA Coordinator) responsible for management and monitoring of progress towards the targets of each Societal Benefit Area (SBA) which can help conduct tasks listed in the plan, monitor the performance of agencies against these tasks and ensuring adequate interaction with the user community in each case; the Coordinators should ensure appropriate connection with CEOS WGs, Constellations and SEO; Weather SBA covered by existing frameworks;
- SBA Teams should report to SIT Chair and support CEO quarterly reports to GEO;
- Volunteers have already been identified for the CEOS SBA Coordinator roles and are cited above;
- With GEOSEC, CEOS should, as soon as practical, address inconsistencies and gaps identified in the space segment targets and tasks, including nomenclature etc.;
- With GEOSEC, agree upon priorities for implementation of the GEOSS space segment in 2008 and beyond and prepare a joint report for SIT-21;
- CEOS IP provides the basis for a more formal communication between CEOS and GEOSEC for future versions of the CEOS IP and Plenary meetings - maintaining the rigorous basis of the GEOSS targets to which our governments and agencies have signed up;
- SIT Chair continues to maintain oversight whilst CEOS Executive Officer supports the interface to GEO;
- We must build on the foundations with sustained effort of progress on individual Work Plan tasks across the various SBAs;
- A formalised feedback loop with GEOSEC will validate priorities for the coming years and steer CEOS efforts – e.g., help identify most pressing requirements for new Constellations studies;

Ivan Petiteville expressed thanks to the IP Task Force which has played a major role in developing this foundation for CEOS in 2006 & 2007 – the Task Force is now concluded.

There was a short discussion on the idea of the CEOS SBA Coordinators and their 'teams':

- Mary Kicza (incoming SIT Chair) recognised the sheer number of actions and the need for people engaged at the SBA working level to help CEOS manage and monitor the true situation internationally in the context of the relevant space segment targets;
- Keith Alverson (GOOS/IOC) hoped that CEOS could learn from the IGOS Theme experience and ensure SBA coordinators are suitably resourced.

Action	**21-6**	**SIT Chair (supported by CEOS SBA Coordinators) to oversee and promote implementation of the CEOS IP priority actions (across all SBAs and cross-cutting) defined for 2008 [the draft priority actions are annexed to Plenary minutes]**	**CEOS-22**
Action	**21-7**	**In relation to Action 21-6, SIT Chair (supported by SBA Coordinators and GEOSEC) to first refine and revise the 2008 priority actions as part of an early analysis of the gaps and inconsistencies in the IP V1.0 to plan its update and improvements in 2008**	**February 2008**
Action	**21-8**	**SIT Chair, in liaison with GEOSEC, to develop the refined list of GEOSS space segment implementation priorities – as the basis for a tour de table at SIT-21**	**SIT-21**
Action	**21-9**	**CEOS Executive Officer to liaise with GEOSEC to ensure formal feedback on the envisaged CEOS IP V2.0 ahead of 22nd CEOS Plenary**	**CEOS-22**

9 Virtual Constellations: Progress to Date and Pilot Reports

Volker Liebig (SIT Chair) introduced this item by reminding participants that the CEOS Virtual Constellations for GEOSS concept was proposed as a concept early in ESA's SIT Chairmanship term, back in early 2006. It has since developed to see the launch of 4 pilot studies, testing the process for us as a way to advance CEOS objectives on a much more focused front. This agenda item comprises progress reports from each of those 4 pilots, as well as a input from the SEO team which NASA has volunteered to help the pilot studies. A way forward paper has been authored by Stephen Ward as one of the Plenary papers and this will also be discussed. The agenda item will also sum up CEOS progress with the 4 pilots and what should be done next in the context of the broader CEOS IP effort.

Mary Kicza added that she had taken the opportunity as incoming SIT Chair to conduct interviews with each of the pilot study leads and had provided them a reporting template for their inputs to Plenary.

9.1 Atmospheric Composition

Ernie Hilsenrath (NASA) summarised efforts on the Constellation study during 2007:

- The objective of the Atmospheric Composition Constellation (ACC) is to collect and deliver data to improve predictive capabilities for coupled changes in the ozone layer, air quality, and climate forcing associated with changes in the environment;
- These objectives meet participating Agency priorities and are aligned to the GEO SBAs;
- ACC will achieve these objectives through the following steps:
  - Develop a Requirements and Gap Analysis based on in-orbit and up-coming missions collecting AC data;
  - Demonstrate how Constellation data can add value to data products serving the GEO SBAs;
  - Develop rationale, strategy, and standards for new mission(s) to meet requirements not being met and possible new requirements. The ACC strategy will address architecture, schedule, and possibly costs.
- ACC initiated three near term projects to demonstrate the Constellations concept. Projects involve four of its international partners using five different instruments. Projects were selected for near term results and aligned with SBAs; Projects will show added value using constellation data over data used separately. Three projects are now in their implementation phases:
- *Pollution prediction using Envisat and Aura*: Health/Air Quality (NOAA lead);
- *Aircraft volcanic ash warning using Envisat and Aura*: Hazards (ESA lead);
- *Smoke prediction from biomass burning using Aura, Aqua*, CALIPSO: Hazard and Health (NASA lead);
- Longer term projects will engage more satellites and international partners focused toward GCOS objectives. These are now in the planning phase with CSA, JAXA, CNES, DLR, and the EC;
- A Requirements and Gap Analysis is underway and a draft report is expected in January 2008;
- ACC has conducted two Workshops with its partner agencies: *Approval of Constellation concept and approach, Development of Projects, Review of longer term plans;*
- Key Planned Activities include: aligning the ACC Work Plan with the developing CEOS IP for GEOSS; demonstrating that Projects provide value-added data for GEO and Agency priorities; making projects "operational" (which will require new funding); progress on mid term projects directed toward GCOS and Climate SBA; complete Requirements and Gap Analysis that leads the way to a new Constellation architecture that meets GEOSS goals; explore international agreements and commitments (via CEOS or other arrangements) to implement the proposed approach;
- Key Challenges include: maintaining active engagement by ACC study team; securing funding to continue the ACC effort, including project implementation; ensuring partner Agency management support for GEO, CEOS, and Constellation concept; demonstrating that the ACC approach supports agency priorities and ensures a path to meeting SBA needs;

- Requested SIT and CEOS support includes: CEOS statement of a clear concept and broad guidelines for Constellation development; employing the Constellation concept in the CEOS IP for GEOSS as a means for real and specific implementation.

9.2 Precipitation

Riko Oki (JAXA) reported:

- The objective of the Precipitation Constellation is to establish an international framework to guide, facilitate, and coordinate the continued advancements of multi-satellite global precipitation missions;
- Accomplishments include: 15 international agencies and organizations have confirmed their participation in the CEOS Precipitation Constellation development by building on existing multi-satellite precipitation products incorporating TRMM data and using the Global Precipitation Measurement (GPM) mission as the cornerstone for international collaboration on satellite precipitation algorithm research, ground validation, data processing, and product dissemination;
- PC has established an international working group (in coordination with WMO CGMS/GSICS) to develop a consensus reference standard for cross-calibration of microwave radiometers to produce uniform global precipitation products within a consistent framework;
- The NASA Precipitation Measurement Missions (PMM) Science Program received approval to accept no-cost research proposals from international investigators outside the standard proposal cycle to complement existing science team activities and to facilitate international collaboration on precipitation algorithm research, ground validation, science investigations, and societal applications;
- NASA and JAXA co-lead the TRMM and GPM PC space and ground segment, GV, and research activities. NOAA, CNES, ISRO, EUMETSAT, NRL, ESA, AEB/INPE, CSA/EC, and DLR have affirmed their support for the PC and have developed, are developing, or planning supporting space, ground, GV, or research contributions;
- NASA, JAXA, NOAA, NRL, and ISRO are supporting the cross-calibration international working group; NASA funds and manages the PMM Science Program;
- Planned activities include: completion of study outcomes identified in *CEOS PC 2007 Work Plan:* moving GPM from formulation to implementation phase at NASA and JAXA and expanding international participation; enhancing merged multi-satellite global precipitation products from existing TRMM-based Precipitation Constellation (e.g., NASA 3B42, JAXA GSMaP, NOAA CMORPH/QMORPH, NRL, EUMETSAT MPE); and, developing common reference standards for inter-calibrations of microwave brightness temperatures and constellation-based global precipitation products;
- Key challenges include: formalizing international agreements on GPM participation; enhancing high-sensitivity light and solid precipitation measurement capability in polar latitudes (e.g. through EarthCARE); exploring opportunities to include additional space-based and ground assets from other nations to augment the next generation PC (eg, the possible use of Russian or Chinese radiometers); and, continued support for open data sharing through either CEOS or GEO;

SIT and CEOS support requested on a range of implementation actions was identified below:

- Achieving *Key Challenges* identified below:
- ISRO/CNES to acquire the capability to make Megha Tropiques data available in real-time, which is important for the CEOS constellation to meet the needs of the application communities such as NWP and hydrological prediction. The SIT should assist in locating a ground station in the Southern Hemisphere to enable ISRO/CNES to collect data more than three times a day;
- Russia to make available to the PC the radiometric measurements from the ROSHYDROMET MTVZA sounder/imagers;
- China to make available to the PC the radiometer measurements from the FY-3 MWRI and MWHS imager and sounders;
- ESA and JAXA to implement a high-sensitivity light and solid precipitation measurement capability in EarthCARE;
- NASA and JAXA to commit resources for the timely implementation of the GPM mission and encourage more space agencies to contribute to the GPM constellation including the constellation satellite in the planning stage at AEB/INPE;
- All PC contributors to adopt an open data sharing philosophy through an explicit agreement that all data should be freely and openly available to all requestors.
- To adopt policies and approaches that recognize the unique status of the individual prototype constellations in different stages of development and their needs to be engineered differently.

Gilberto Camara added that the Brazilian government had approved development of the GPM satellite by INPE. Agreements in definition with NASA for using a radiometer from GSFC on the satellite.

9.3 Land Surface Imaging

Bryan Bailey (USGS) reported:

- The objectives of LSI Constellation are: to define characteristics that describe optimal capabilities (and policies) that can become guidelines (or ***standards***) in the development and operation of future LSI systems; address current and near-term problems and issues facing the land remote sensing community today; work more cooperatively in the operation of existing systems; and, realize tangible benefits to society through application of LSI data;
- 2007 Goals: agree to cooperate in operating existing mid-resolution LSI systems; define preliminary standards for future mid-resolution LSI systems; contribute mid-resolution LSI data to the FRA2010 Project;
- Accomplishments include: ***Declaration of Intent for Cooperation on Mid-Resolution Satellite Systems*** was signed by seven of eight agencies that operate such systems; additional agreements were drafted for review by the agencies to initiate cooperation related to data access, data acquisition, and ground systems; the group compiled user information requirements; it developed preliminary *standards* for mid-resolution LSI systems; and it prepared a draft agreement to provide LSI data to the FRA2010 Project;
- Agency Contributions: CNES, CONAE, CSA, ESA, INPE, JAXA, NASA, NOAA, and NRSCC have members on the LSI Constellation Study Team, which is chaired by USGS and ISRO; contributions include advising, presenting papers, writing documents, etc.;

- Key Planned Activities: participate in the Inaugural Meeting of the ISIS Working Group; present LSI Constellation overview to LDCM Science Team; hold Study Team meeting early in 2008; continue to work on unfinished tasks from 2007 Work Plan;
- Key Challenges: dedicating sufficient personnel resources to accomplish the work; securing agency concurrence on documents approved by Study Team; fully engaging the land remote sensing user community; balancing agency agendas with common goals; managing expectations, such as what reasonably can be achieved and in what timeframe;
- Support requested of SIT and CEOS: Need people to formulate and conduct LSI Constellation plans and activities who are: experienced and knowledgeable in science, technology, and applications of land remote sensing; able to devote meaningful time, energy, and expertise;
- Need the space agencies to view LSI Constellation activities as being important to their future and make supporting those activities a priority;
- Specifically, it was requested that space agencies support the LSI Constellation with 0.2 Full-Time Equivalent (FTE) work time from one or more of their staff annually, and to provide their Study Team member funding to participate in two Study Team meetings per year.

9.4 Ocean Surface Topography

Stan Wilson (NOAA) reported:

- The objective of the OST Constellation is to implement a sustained, systematic capability to observe the surface topography of the global oceans – from the basin scale to the mesoscale (~100km). The surface topography from satellite altimeters and the upper-ocean density field from Argo profiling floats are oceanic analogues to the surface pressure from barometers and the density field from atmospheric profilers. Observations of these two fundamental state variables are necessary for understanding the dynamics of the oceans, assessing their role in climate, and developing an operational forecast capability;
- Accomplishments include: data availability from multiple altimeters since 1992, plus realization of the Argo array, has initiated the sea-level climate data record, as well as helped establish operational oceanography;
- The Venice Symposium has developed consensus recommendations;
- Key Planned Activities: OST Constellation Workshop, January 29-31, 2008: Develop a strategy for implementation – over the next 15 years – of the recommendations from the Venice Symposium; Launch of OSTM/Jason-2 in June 2008;
- SIT support requested on: resolution of the approach for the follow-on to OSTM/Jason-2 in time to provide an opportunity for an adequate overlap between the two missions; engaging key officials of the State Oceanic Administration (China) to collaborate in altimetry; with timely data access as a goal, this could initiate scientific involvement needed to assess the extent to which results from different missions can be validated and integrated.

Stan stressed that a 6-month overlap between altimeter series missions is required for the accurate climate data record (a 14cm difference between JASON and its predecessors was resolved in the past for example, and this is crucial for climate applications).

Mike Rast (GEOSEC) noted that China is represented as co-chair of GEO EXCOM. Mike offered to help in the case of the OST Constellation and its communications with China's State Oceanic Administration.

Action	21-10	**GEOSEC to convey request of OST Constellation team to GEO Co-Chair from China for engagement of the Chinese Oceanic State Administration in the Constellation efforts**	**December 2007**

9.5 Requirements Analysis and Systems Engineering

Stephen Sanford (NASA) reported that the SEO has been developing a simple but holistic model of GEOSS. Starting with the GEOSS reference document, they are flowing the SBA observation requirements into a GEOSS space segment measurements set - integrated across all SBAs. This will help identify where economy of observations can be achieved and save overall effort.

Mike Rast (GEOSEC) noted that the SEO ambitions are extremely difficult to achieve, and hoped that CEOS analyses would seek to make best use of existing assets as far as possible – in the spirit of the GEO initiative.

9.6 Way Forward

Mary Kicza (NOAA) noted that in the interview process, CEOS had challenged the study leads to be very specific in where they need help. They have met that challenge with very clear actions which require response. Mary asked that CEOS agencies consider responding back in kind.

Action	21-11	**SIT Chair to engage CEOS Principals to help address the implementation actions identified by the 4 Pilot Constellations**	**SIT-21**

Stephen Ward (ESA SIT Team) gave a short presentation summarising the main points of the Plenary discussion paper which proposed next steps on the Constellations process in 2008:

- **GEOSEC-CEOS report on Space Segment Implementation Priorities (Apr 2008 / SIT-21):** GEO validation of CEOS choice for any additional Constellation studies (as well as all other CEOS IP activities); Formalisation of the CEOS-GEOSEC annual cycle of dialogue; Baseline is version 1.0 of the CEOS IP; GEO Summit may yield some surprising directions & priorities and these should be reflected;

- **Comprehensive Constellations framework review (early 2008):** Review management framework; Determine the role and scope of the SEO's work in supporting the CEOS IP and the Virtual Constellations; Recommendations on whether/how CEOS might establish further Constellation studies; reflecting space segment priorities agreed with GEOSEC; include consideration of existing proposals: Disasters & Ocean Colour; Ensure we have the right process and adequate support before launching additional efforts;

- **Full update of Constellations Process Paper.**

Stephen thanked: the 4 Pilot study leads and their teams for efforts in 2006 & 2007; the SEO for their initial deliberations on how best to help the process; Principals for resourcing these efforts.

Action	21-12	**SIT Chair, supported by Pilot leads, the CEO, the SEO, and GEOSEC, to undertake a review of the Constellations framework and supporting documentation in time for discussion at SIT-21. This should include: consideration of whether further studies should be invited and on what topics; and consensus on the role for the SEO.**	**SIT-21**

9.7 Summary

Volker Liebig (SIT Chair) gave a brief summary of the content and conclusions of agenda items 8 & 9. He noted that CEOS and SIT Chairs had stopped short of asking individual agencies to make specific commitments to priority actions at 2007 Plenary – purely through lack of time available to assemble a suitable list which encompassed all agencies and ensured the broadened commitment which CEOS seeks. He noted that incoming SIT and CEOS Chairs had undertaken to ensure this process is completed in 2008 (Mary Kicza has indicated a target of SIT-21, following an analysis exercise to target required improvements in v1.0 of the IP).

Volker noted the important role of the new SBA coordinators in gathering information and reporting on progress and hoped these roles would be supported by the relevant agencies. He concluded by noting that CEOS will in future seek to have formal feedback from GEOSEC on the annual update to the CEOS IP ahead of CEOS Plenaries so that a constructive dialogue on key tasks and future priorities can become the core business of Plenary. Plenary actions will become the IP priority tasks for the coming year.

10 GEO Feedback on CEOS Progress and Future Coordination

Mike Rast (GEOSEC) gave a presentation summarising feedback on CEOS progress and future coordination:

- He extended greetings and regrets of Jose Achache as GEOSEC Director;
- Emphasised the need for linkages between *in-situ* and space assets;
- CEOS is a key Partner for GEO and the main provider of space-borne systems for the Global Earth Observation System of Systems (GEOSS); as collectively representing the space agencies CEOS is quoted as the "Space Arm" of GEO; interface with CEOS is the GEO Secretariat Expert in charge of the space component;
- GEOSEC notes the progress towards the CEOS IP: Virtual Constellations should be a major contribution to the GEO Work Plan; modalities for including future constellations are to be considered in the near future; interim Virtual Constellations will be nurtured as part of GEO Work Plan until CEOS mechanism is in place (as agreed at SIT 20);
- Regarding IGOS Themes transition – it was noted that the Themes are already working on GEO WP tasks and the transition process is going very smoothly;
- GEOSEC currently sees the main contributions of CEOS to GEOSS as being: the Working Groups and the Virtual Constellations; and improvement of the cross-cutting value of space

assets to serve all SBAs. It was noted that 40 GEO tasks involve CEOS, - 8 of which have CEOS providing the leading role;

- GEOSEC expects that CEOS will guarantee the cross-cutting dimension of the space assets for GEOSS as a priority; ensure completion of the CEOS-powered tasks of the GEO WP 2007-8; ensure provision of space assets input to the GEO WP; and, support the implementation of space related assets for GEOSS.

- Ministerial Summit 2007 in Cape Town: 100 "Early Achievements" submitted to date.

Lars Prahm (EUMETSAT) suggested that there are pertinent lessons from the meteorology community experience regarding how we connect the in-situ and space data and processes and make the results useful. On a daily basis, in-situ meteorological measurements and space data are collected globally: 25,000 in-situ data and 5-10 million individual space observations collected and communicated to World Meteorological centres and assimilated into global 4-D models with results providing present and future state of atmosphere. These are redistributed to each country of WMO (around 180) and received and used and circulated to derive products daily to citizens. What we are talking about in GEO can be learned from the meteorological community which is running such a system. A user-driven system is required to solve problems and deliver to users. Focus on a user-driven process is needed.

Gilberto Camara (INPE) suggested that the CEOS IP be pruned of the many tasks which are not core to space agency interests. He congratulated CEOS on the development of the IP as a major achievement but cautioned that the next step is important and that CEOS needs to focus and deliver on a small number of tasks rather than not deliver on a large number. The Virtual Constellations must be implemented. CEOS must demonstrate an implementation capability.

11 Dialogue on CEOS Implementation of GEOSS Space Segment

Barb Ryan (Chair) instigated a short *tour de table* of Principals asking each agency to reaffirm its commitment to engage in the IP process and to help move CEOS to an action-oriented agenda in support of the GEOSS Space Segment. Some of the comments from this exercise were:

- Mary Kicza (incoming SIT Chair) stressed that she hopes to see a discussion of specific agency commitments at SIT-21 in April 2008 – rather than wait until next Plenary;
- Pascal Ultre-Guerard (CNES) stressed the role of the Constellations and the support of the CEOS Working Groups to that process;
- Klaus Schmidt (DLR) suggested that realistic expectations of resourcing must be reflected in any call for commitments in CEOS;
- Lars Prahm (EUMETSAT) confirmed that EUMETSAT will emphasise its support to the OST Constellation effort;
- Gilberto Camara (INPE) suggested that the Hawaii meeting had been the most significant meeting of CEOS for a long time and the realisation of the IP is worth fighting for;
- V Jayaraman (ISRO) recalled that ISRO was a recent re-visitor to CEOS but hopes to engage more in future including in the Working Groups;
- Makoto Kajii (JAXA) confirmed JAXA support for the IP;

- Paul Mason (GCOS) observed that it was a pleasure to develop the interaction with CEOS and to see CEOS progress to engaging systems and delivery in a business-like evolution. He said that the challenge now is to recognise the accomplishments of agencies when under the meteorology banner – bring this together with what CEOS is doing and the sum of the parts is very impressive;
- Volker Liebig (ESA) and Barbara Ryan (USGS) both expressed ongoing support of their agencies to the important coordination efforts of CEOS;
- Keith Alverson (GOOS/IOC) confirmed continued IOC and GOOS engagement with CEOS and in particular expressed strong support for the Ocean Surface Topography Constellation.

Barb Ryan (Chair) thanked Principals for their overwhelming message of support for the CEOS IP and for its implementation in the coming years.

12 CEOS Executive Officer Report

Jean-Louis Fellous (ESA/CNES, CEOS Executive Officer) gave a presentation summarising his activities in the CEO role during 2007:

- He reminded Plenary of the key terms of reference:
  - At least in the initial period of two years, the CEO will concentrate on ensuring the efficient conduct of the CEOS contribution to GEO – including the implementation of the response to the GCOS IP, the GEO Work Plan, and the development of the Constellations;
  - The CEO will report to the CEOS Chair. In areas where the CEOS Chair has delegated authority to the SIT Chair, the Executive Secretary will report to the SIT Chair and will keep the CEOS Chair informed;
  - The CEO will be an *ex officio* member of the CEOS Chair's Strategy Group ("Troika", SIT Chair and Vice-Chair) and in this capacity will service meetings or teleconferences of the Group;
  - Under the leadership of the CEOS Chair's representative, the CEO will participate in the work of the CEOS Secretariat;
  - The CEO will similarly be an *ex officio* member of the CEOS Implementation Plan Task Force (the Task Force is now concluded).
- 2007 activities and achievements include:
  - Contribution to and interaction with GEO;
  - Monitoring progress in CEOS contributions to GEO Work Plan 2007-2009;
  - Coordinating CL-06-02, under CEOS Chair supervision and in relation with GCOS Secretariat and GEO Secretariat;
  - Coordinating DA-07-03 (Virtual Constellations) with GEO Secretariat (Michael Rast);
  - Helping assemble DI-06-09 Task team with GEO Secretariat (Giovanni Rum) and CSA (Guy Seguin);

  - Representing CEOS in GEO Summit Task Force 2 (draft report on progress and early achievements);
  - Supporting GEO Secretariat on "Iridium-Next" Earth Observation secondary payloads opportunity;
  - Current and future challenges include: heavy documentation; large number of participants requiring significant coordination efforts; significant travel and outreach notably to GEOSEC and SIT;
- CEOS Response to GCOS-IP: Establishing Priorities within the 59 actions; identifying Climate Focal Points; assembling Climate Action Teams; setting up a framework for planning and reporting (Climate Action Status Report Forms); getting inputs from all participants in Climate Action Teams; reporting on progress to the GCOS Steering Committee meeting (Paris, 16-19 October, 2007); representing CEOS in R/SSC-CM preparatory meetings and in WMO Global Observing System Optimization Workshop;
- CEOS Implementation Plan: Contributing to the overall structure and table of content; and providing material for the Climate SBA sections.

Jean-Louis suggested that the CEO is an embryo of a true CEOS Permanent Secretariat. The GEO Secretariat is a model of an efficient small group able to perform the necessary functions – coordination, monitoring, reporting, outreach. A CEOS Permanent Secretariat should include 3-4 persons, on secondment by their agencies (as was done for GEO Secretariat by USGS, ESA, ASI and JAXA and for himself by ESA and CNES). There is no need for co-location (unless with GEO in Geneva?). There is no need for a dedicated budget: most activities should be based on in-kind voluntary contributions.

Jean-Louis Fellous reminded Plenary that ESA offers to provide the CEO for another period of two years and that Ivan Petiteville has been selected for this position. He will benefit from the newly-adopted CEOS Implementation Plan, which he should use as a guide for his duties. It is now time to move from craftwork to modern information technology methods – ESA is willing to consider devoting some funding to establish a Web-based tool for CEOS-IP monitoring and reporting.

Action	**21-13**	**CEOS Executive Officer to investigate whether a simple on-line information system could be applied to assist the task of monitoring and managing GEO WP tasks**	**CEOS-22**

On behalf the entire community, Barbara Ryan (Chair) thanked Jean-Louis for his years of strong and expert leadership in CEOS, and most recently for his outstanding contributions in 2007 as CEOS Executive Officer. She wished him well in his new position at COSPAR.

13 WGISS Report and Actions

Ivan Petiteville (ESA/WGISS Chair) gave a presentation summarising the activities and achievements of WGISS since the last CEOS Plenary:

- Strategic realignment of WGISS to better support the CEOS IP / GEO: closure of 5 Task Teams (TT) to free resources; creation of a Sensor Web TT (requested by GEOSEC Director)

with the same Leader as the GEO Sensor Web task; creation of a Strategy Task Force: findings & recommendations to improve support to CEOS and GEO;

- 1/3 of the GEOSS components are registered as "CEOS" contributions;
- Presence in GEO reinforced with motivated staff: WGISS members contribute to 18 GEO 2007-2009 tasks and to "Standard Interoperability Forum"; WGISS presence as CEOS co-chair of "GEO Architecture & Data Committee" (ADC); 5 WGISS members attended last GEO ADC meeting (Sep. 2007);
- CEOS Interoperability Handbook (addresses many GEOSS domains);
- Several performing activities e.g., GRID projects, WTF Core Sites, WTF CEOP (water cycle), EO Data Portal project, Global Data Sets;
- All WGISS activities related to "Plenary Data Utilization" action have fulfilled all the original requirements - activities to be stopped by end 2007;
- Fruitful cooperation activities with WGCV: Cal/Val portal in operation;
- Meetings: Two WGISS meetings + several teleconferences in 2007; WGISS-WGCV joint meeting (Feb. 08); collocated WGISS-GEO ADC meeting (Sep. 08);
- Outreach: WGISS chair/sponsor of several conferences; several articles;
- There will be a change in WGISS leadership (new WGISS Chair M. Maiden – NASA): several other new Chairs, Vice-Chairs & Task Team Leaders;
- Current and future challenges include: the need for agency support to WGISS to secure the accomplishment of on-going GEO-related actions; slow response of WGISS on a few actions (e.g., GCOS) due to lack of staff; contributions to GEO (CEOS IP) are mainly either of expertise type or integration into GEOSS of existing systems; not enough resources to perform new activities; potential support to additional GEO tasks to be identified in 2008 with estimated resources and foreseen CEOS Agencies;
- WGISS will implement strategic realignment of the Group following recommendations from WGISS Strategic Task Force – with the first concrete actions at WGISS-25 (Feb. 2008);
- WGISS Task Teams to prepare a yearly plan of activities with milestones - plans to be presented at WGISS-25 (Feb. 2008);
- WGISS Support to Constellation Teams to be formalized;
- Potential cooperation with SEO.

Ivan Petiteville concluded by repeating that if WGISS is to deliver on CEOS IP tasks then suitable resources and expertise will have to follow. Michael Rast reminded that GEOSEC may be able to help advocate for the required resources.

Action	**21-14**	**CEOS Executive Officer to liaise with SIT Chair, WG Chairs and GEOSEC to identify priority WG initiatives on which GEOSEC might assist with appeals for resources**	**March 2008**

Gilberto Camara (INPE) congratulated WGISS on their achievements. He referred to the recently completed project to make the Landsat historical archive of Brazil accessible online for free.

Action	21-15	Gilberto Camera to provide CEOS Chair with the web address of the Brazil Landsat free archive	December 2007

14 WGCV Report and Actions

Changyong Cao (NOAA/WGCV Chair) gave a presentation summarising the activities and achievements of the WGCV since the last CEOS Plenary:

- Leading cross-cutting GEO task (DA-06-02): developing data quality assurance strategy for GEOSS (broad participation); GEO-CEOS Workshop on Cal/Val (sponsored by GEO and ESA, Oct. 2007); developing the framework and guidelines for cal/val; identified key elements for a data quality strategy to achieve interoperability for GEOSS; reached consensus that quality assurance should be incorporated into satellite programs;
- Cal/val portal (ESA): the first step towards harmonization;
- Addressed issues related to cal/val standards, consistency, and interoperability at the GEOSS workshop (co-sponsored with IEEE at IGARSS07);
- Coordinated the activities and reporting related to data quality assurance. Progress recognized as early achievement. http://calvalportal.ceos.org;
- CEOS IP Climate Actions: Major progress in two Priority-1 actions:
  - FCDR (T-4): Quantified the measurement consistency among AVHRR, MODIS, and ATSR for generating Fundamental Climate Data Records (FCDRs) (NASA, NOAA, ESA, CCRS/CSA, USGS). This was documented in a submitted journal paper;
  - Benchmark Mission Planning (A-5, C-7): Active studies on TRUTHS (NPL)and CLARREO (NASA); excellent opportunity for international collaboration through CEOS;
- WGCV also providing support to the CEOS constellations;
- Current and Future challenges include: as more and more satellites are launched, data quality assurance becomes increasingly more important; we face many challenges: stringent cal/val requirements for climate change detection (stability on the order of 0.1K per decade); lack of standards for data quality and on-orbit SI traceability; getting sustained agency support for cal/val is challenging;

Areas for CEOS agency endorsement and support were highlighted:

- All satellite programs should include adequate support for cal/val;
- Establish quality assurance framework based on best practices, including: Cal/Val portal (support further development and use as the entry point for Cal/Val information); develop CEOS endorsed Cal/Val reference sites; establish data policy for the access and use of Cal/Val data;
- Support recalibration for generating FCDRs;
- Provide adequate resources for additional CEOS IP tasks (eg, Priority-2 climate action on ocean sensor cal/val (O-18) next year);

- Coordination on benchmark measurement missions (climate action A-5): in the context of A-5 and GEOSS data QA, space agencies should consider how best to coordinate, collaborate and implement the complimentary "international benchmark reference" mission proposals: TRUTHS and CLARREO (this may present an opportunity for a "Benchmark" constellation);
- Other recommendations: invest in comprehensive pre-launch calibration (especially for SARs) to facilitate post-launch calibration/validation.

Action			
	21-16	**In response to WGCV request, CEOS and SIT Chairs to explore mechanisms for improved coordination on benchmark measurement missions (climate action A-5)**	**SIT-21**

Barbara Ryan (Chair) stressed the importance of compliance with the GCMPs for agencies planning to launch missions with ambitions to support the climate record – noting that ESA had taken the lead at the last SIT meeting to indicate how the Sentinels would be planned to accommodate the GCMPs.

Changyong Cao noted that WGCV and GSICS complement each other well. GSICS is taking concrete steps to bring cal/val to operational problems starting with infrared, and extending to optical and microwave.

Steve Ungar (NASA) observed that some missions have had adequate pre-launch calibration but many do not. There is a tremendous concern that this needs to be addressed. NIST will host the next cal/val reference sites workshop, and Changyong Cao is asking for resources; CEOS agencies need to support participants.

15 WGEdu Report and Actions

Yolanda Berenguer (UNESCO/WGEDU Chair) gave a presentation summarising the activities and achievements of the WGEdu since the last CEOS Plenary:

- 8th WGEdu annual meeting, 30 April-2 May 2007, Frascati, Italy;
- New members (CSIR, CNES, GISTDA); G. Bridge (EUMETSAT) as incoming Chair and TM Sausen (INPE) as incoming Vice-Chair;
- WGEdu Education Resource Portal (hosted by Beijing University): mirror site developed by EUMETSAT; Regional Coordinators;
- Follow-up to 1st WGEDU workshop for Latin American secondary school teachers, 3-5 Oct 2007, Cordoba, Argentina;
- 2nd WGEdu workshop: 26-28 Nov 2007, Capetown, South Africa;
- Input to the GEOSS process as Lead & Contributing Organization: CB-07-01a: 1st GEO Capacity Building Donors symposium, September 2007, Sevilla (Seville roadmap to be presented at the GEO Ministerial Summit); CB-07-01b (CO): Review of best practices and gap analysis; CB-07-02 (LO): Development of a knowledge portal on disaster management in the framework of the UN-SPIDER programme;
- Identification of themes & leaders for pilot projects to test "Data Access Principles"; projects for International Polar Year (2008); synergy with other WGs;

Resources are required if WGEdu is to progress its future plans:

- Implementation of pilot projects relevant to "Data Access Principles": Landslide mapping using CBERS-2B data (INPE, Beijing University & CRESDA); Use of images derived from International Charter on Major Disasters: ERS/ENVISAT, SPOT, RADARSAT, ALOS; a 3rd theme will be identified after the 2nd WGEdu workshop (26-28 Nov 2007, Capetown, South Africa);
- Development of projects for International Polar Year (2008) – proposed by Norwegian Space Center;
- Enhancement of WGEDU Education Portal of education/capacity building resources related to disaster management;
- Representation of WGEDU in regional & international education/capacity building-related activities and events.

Lars Prahm remarked that EUMETSAT is looking forward to contributing to this Working Group through its role as Chair. In particular, they believe that their experience of training and capacity building within the African context will be of value to the work of the group. EUMETSAT has been involved for some time in PUMA and its successor project AMESD - African Monitoring of the Environment for Sustainable Development - in order to help African Countries better manage their natural resources. For the time being, more than 100 EUMETCAst receiving stations are available in Africa. The AMESD project will significantly increase this number. Experience with these projects, coupled with the GEONETCast distribution system, could be particularly beneficial as this basic infrastructure could be used for the distribution of additional data, with various regional themes, throughout Africa. More specifically, this experience and infrastructure should greatly assist in the implementation of the 2 climate actions in the Implementation Plan (C-20 and C-22) that relate to ease of access to climate products in developing countries (Training and Capacity Building). EUMETSAT is therefore offering to distribute products of relevance to Africa through EUMETCast / GEONETCast within available bandwidth.

16 IGOS-P Coordination and GEO Transition Issues

Robert Missotten (UNESCO) on behalf of Walter Erdelen (IGOS Co-Chair) expressed strong support for the CEOS efforts on IGOS-P transition. In order for the transition to be successful it is necessary for the Partners to continue long term support for the new activities to be undertaken.

Mike Rast (GEOSEC) reminded participants that following the discussions at the last CEOS Plenary, SIT and IGOS-P meetings, a note had been issued by IGOS-P Co-Chairs announcing the transition of the IGOS Themes into the GEO framework. GEOSEC, supported by the Theme teams (especially Stuart Marsh), invited all 8 themes to make contact with GEOSEC and enter negotiations to define exact terms of transition and identify any issues. Detailed discussions were held, seeking to sustain the capacity and competence of the Theme teams. The process has gone very well with all 8 teams responding and some already assembling communities of practice. GEOSEC thanks he IGOS Partners and Themes for their superb support – and particular thanks to Stuart Marsh, Roy Gibson and Bryan Bailey. GEOSEC is looking forward to a fruitful cooperation and to maintain the success of the IGOS Themes.

Barbara Ryan (Chair) confirmed that there will be a 1-day IGOS bis meeting in South Africa (Tuesday) where the Partners will assemble to agree on final declarations and will decide whether to have a final P-15 meeting next May.

Action			
	21-17	**In connection with transition of IGOS Themes to GEO, CEOS Agencies urged to continue their support of IGOS Theme Team Leads and members within their organization to enable IGOS Theme contributions to continue within GEO**	**CEOS-22**

17 Review/Approval of CEOS Input to the GEO Plenary and Ministerial Summit

Jean-Louis Fellous (CEO) summarised the draft CEOS report to the GEO Plenary and Ministerial Summit meetings noting that the key messages related to: realignment of CEOS work toward GEOSS Development and Maintenance; support to GEO Tasks; climate SBA highlights; Virtual Constellations Initiative; CEOS IP for GEOSS Space Segment; data sharing challenges.

Paul Mason (GCOS) suggested that the Constellations texts focus on the concrete products and services which are accessible to all GEO members – to avoid impressions of a space-faring nation limited club.

Brent Smith (NOAA) suggested adding a forward looking element – including mention of new Constellations, and plans to improve and update the IP in 2008. The message to GEO should include more about what CEOS pledges to do to step up.

Mike Rast (GEOSEC) remarked that it would be great to see how CEOS intends to start implementing the space arm of GEOSS in the statement – with an indication that more than climate is being covered and that cross-cutting issues are reflected.

Jean-Louis explained that the first draft had been developed in Hawaii and that a small team would work to refine the paper ahead of Cape Town.

18 CEOS, CGMS and WMO Coordination & Support to GEO

Tim Stryker (USGS) reported on efforts on this during 2007:

- There has been a dialogue between CEOS Chair (USGS), WMO Space Programme (Jerome Lafeuille), and EUMETSAT (Robert Husband and Paul Counet);
- It was noted that WMO, CGMS and CEOS together contribute to a number of important initiatives; WMO alone participates in half of the WP tasks and leads 16.

Future challenges were identified as:

- Strengthened convergence among agency plans and user requirements;
- R/SSC-CM support among operational and research agencies;
- Common approach and coordinated implementation of GCOS and GEO actions;

- Internal and external communications on relationships/synergies among tasks of CEOS, CGMS, and WMO SP;
- CEOS/WMO database of observational data requirements/ observing systems capabilities.

EUMETSAT (as the CGMS Secretariat) reported to CGMS and got full support for increased cooperation with CEOS. Tim suggested a regular meeting among CEOS, CGMS, and WMO Space Programme representatives to discuss common interests. This could be done in connection with other, regularly-scheduled meetings that involve all three organizations.

The way forward was agreed per the presentation material shown:

- Communication/coordination on workshops/meetings of common interest;
- Annual meetings of top-level CEOS, WMO SP, and CGMS-nominated representatives;
- CEOS Chair or her/his designee serve on the R/SSC-CM Executive Panel;
- CEOS Executive Officer coordination and communication with WMO SP on GCOS, WMO GOS, and GEOSS activities.

Eva Oriol (ESA) asked about the newly announced WMO restructuring. Jerome Lafeuille (WMO) responded that the concept of 'programmes' (such as the Space Programme) does not feature as strongly in the new structure which is more along strategic thrusts and outcomes. The Space Programme Office will belong to the Observing and Information Systems Department, WMO Integrated Global Observing System branch – which includes space, surface, and other observation systems, including the GCOS JPO.

Action	**21-18**	**CEOS Chair to implement Plenary decisions on improved coordination with CGMS and WMO Space – including arranging an annual meeting and a representative on the R/SSC-CM Executive Panel**	**CEOS-22**

19 CEOS Publications and Outreach

Kazuko Misawa (JAXA) gave a presentation summarising the activities and achievements since the last CEOS Plenary. The CEOS Newsletter has been produced by MEXT/JAXA as a contribution to the CEOS Secretariat since 1993. The newsletter is produced biannually to introduce current activities and achievements of CEOS and its subsidiary groups. Typically 4000 copies are distributed to CEOS Member agencies and subscribers. The next edition will be in Feb. 2008 (http://www.ceos.org/pages/pub.html#newsletter). MEXT/JAXA has also produced CEOS and IGOS-P brochures in the past. JAXA also works with NASA to maintain the CEOS home page (htpp://www.ceos.org) and updates are invited via christopher.blackerby-1@nasa.gov & ceos-jpn@restec.or.jp .

Mary Kicza (NOAA) expressed the gratitude of the community for the important and continued efforts of MEXT & JAXA.

Eva Oriol (ESA) briefly explained ESA's proposals to develop a 2008 Edition of the Earth Observation Handbook for CEOS:

- 2008 update to the Handbook proposed in response to popular demand;

- A 'Climate Change' Special being considered – with GCOS willing to support; this would build on the CEOS Response to the GCOS IP and include 'Space for Climate' case studies;
- Print and web editions would be produced again, with data gathering planned for early 2008 and final updates (agency plans are always changing) in mid-2008, and distribution by end 2008;
- Underlying database: ESA proposing to relieve WMO of maintenance of core space segment data; will agree on a final approach with WMO; more advanced web features are under study to support CEOS community needs including table and timeline generators filtered by agency, time, parameter, instrument type etc.

Jerome Lafeuille (WMO) and Stephen Ward (for ESA) clarified that dialogue is underway to establish a clear sustainable maintenance strategy for the future version of the underlying database. Stephen noted that ESA will require a contact within WMO on the issue of the database.

Action			
	21-19	**CEOS agencies encouraged to support ESA's anticipated requests in support of the new edition of the CEOS Handbook and the associated database.**	**CEOS-22**

20 CEOS and the Commercial Sector

Paula Freedman (BNSC) gave a presentation summarising the activities and achievements since the last CEOS Plenary:

- There are strong views within the CEOS community that the commercial sector has a role to play;
- In 2006 BNSC, as a SIT Task Force member, was asked to undertake a study on the role of the commercial sector. Preliminary conclusions were reported at the 2006 CEOS Plenary;
- Based on comments received from CEOS members at the 2006 Plenary, further work was undertaken to provide more focussed conclusions – including a look at mechanisms for establishing common interests with the commercial sector. This additional work took place in early 2007 and resulted in the top-level conclusions set out in the CEOS Implementation Plan (P.47 - section 13.4);
- This proposes: SIT Chair should be asked to set up a small light touch commercial task force to consider future interaction; That, if the SIT Chair agrees there should be an open forum with the commercial sector.

Paula noted that the commercial sector can be difficult for a body such as CEOS to get to grips with but that an approach had already been received by CEOS from US and European groups, making various suggestions for going forward.

Mike Tanner (NOAA) noted that US GEO has an industry day in late January and that this event might be utilised to launch further discussions. Gilberto Camara (INPE) said that he favoured such an exploration by CEOS but cautioned against fruitless dialogue with sectors of industry which may have conflicts of interest with those of the CEOS membership. Bryant Cramer

(NASA) suggested that CEOS would have to be particularly creative in this regard, given the influence of large companies. Volker Liebig (ESA) reminded that this is not a new subject and has been addressed before. However, the importance of the private sector has increased since then and GMES in Europe sees the private sector having a role. He suggested it is worth exploring what kind of dialogue can be sustained in the future.

Jim Yoder (IOCCG) noted that there is a need to sustain measurements for which the science is well developed and these are often not that attractive as repeat endeavours to research-oriented space agencies. So there could be a role for the more routine measurements to be provided by industry rather than space agencies. A number of other Principals commented.

Action	21-20	**SIT Chair to develop the proposals on commercial sector engagement including a response (from CEOS Chair) to the letters from Alliance for Earth Observations and EARSC – starting with quick circulation of draft TORs for the small task force proposed**	**SIT-21**

21 Radio Frequency Coordination Matters

Mark Churchyard (BNSC) explained the background and recent progress on spectrum protection issues:

- In 2006 BNSC produced and presented a report on frequency spectrum management to CEOS Plenary; the report incorporated information from CEOS members on the frequencies that they currently or proposed to use; this was acknowledged as a very important topic to be continually reviewed and BNSC agreed to provide an update to this report;
- BNSC originally planned to produce the updated report for this Plenary but took a decision to delay its release in order to take into account the outcomes from WRC 2007 and give CEOS members more time to complete the questionnaire;
- The questionnaire has been circulated to CEOS members to provide an update on the information collected last year; a preliminary review of the outcomes from WRC 2007 has been included. These include references to (proposed) spectrum band changes and whether they are considered of significant consequence to the EO community;
- In order to provide as comprehensive an update report as possible, **CEOS members are urged to provide the required information and return the questionnaires;** it is planned to have the report for distribution by April 2008 with questionnaires returned not later than end of January if they are to be included; the report will contain the outcomes from WRC 2007 likely to have an impact on the EO community with specific reference to the agenda for WRC 2011; it is planned the report will be circulated electronically to CEOS members.

Action	21-21	**CEOS agencies urged to return the frequency protection questionnaire to BNSC**	**December 2007**

It was agreed that it would be helpful for CEOS agencies to approach their relevant government departments by having a pre-written statement from CEOS.

Action	21-22	**CEOS Chair to confer with BNSC and Edoardo Marelli to investigate the possibility of a CEOS note for agencies to provide to national reps to ITU on frequency protection for Earth observation.**	**ASAP**

22 Calendar Nov 2007 – Nov 2008

Barbara Ryan (Chair) reviewed the CEOS Calendar for 2008 kindly provided by CSIR and asked CEOS agencies to note the key meeting dates.

SCHEDULED MEETINGS	START DATE	END DATE
WGISS 25 Joint Meeting - CHINA	25.02.08	29.02.08
WGCV 28 - CHINA	25.02.08	29.02.08
SIT 21 Woods Hole, Massachusetts	22.04.08	24.04.08
WGEdu 9 - INPE BRAZIL	28.04.08	30.04.08
IGOS-P 15 UNESCO-HQ Paris	28.05.08	30.05.08
WGCV 29 TBC (Europe)	XX.08.08	XX.08.08
WGISS 26 TBC	15.09.08	19.09.08
SIT 22 Japan	16.09.08	18.09.08
CEOS PLENARY South Africa	10.11.08	13.11.08

Mary Kicza (NOAA/incoming SIT Chair) confirmed that SIT-21 will be held at Woods Hole (Boston is the local airport). NOAA will also work with WGISS to resolve the possible conflict of dates for the September meetings of SIT and WGISS. SIT dates cited include a first day of pre-meetings, followed by two days of SIT.

It was noted that the decision on whether an IGOS-P-15 meeting (a single day only) will be held will be made in Cape Town. Theme Team Leaders meeting would preferably be held in connection with future GEO meetings since IGOS is now related to GEO.

Changyong Cao (WGCV Chair) clarified that WGCV 29 will be held in September or October in Europe.

23 Future Chairmanship

Barbara Ryan (Chair) confirmed that the following agencies will succeed USGS as Chair of CEOS:

- CSIR of South Africa for 2008;

- GISTDA of Thailand for 2009;
- INPE of Brazil for 2010;
- A Europen Chair for 2011 is still to be determined, although it was noted by CEOS Chair that preliminary discussions on this question have been held with DLR.

Action			
	21-23	**CEOS Chair to confirm acceptance in writing of INPE's offer to serve as Chair for 2010; and CEOS SEC to confirm CEOS Chair candidates for 2011**	**CEOS-22**

24 2008 CEOS Chair Vision

Pontsho Maruping (CSIR/incoming CEOS Chair) explained that CSIR is an Associate Member of CEOS. Ms Paruping works for Department Of Science and Technology (DST) which looks after CSIR within the government. She is General Manager for Space Science and Technology - including for establishment of the South Africa Space Agency and Strategy. Wabile, Alex, and Asanda are all present at Plenary for the CSIR CEOS team. Ms Maruping remarked that CSIR is honoured to take on the challenge of CEOS Chair and will pursue the following areas in 2008 in coordination with SIT Chair, the CEO and supporting CEOS agencies:

- Progress towards targets of CEOS IP;
- Management and monitoring of CEOS IP;
- Establish space priorities for GEOSS;
- Sustained progress on CEOS constellations;
- Publish the 2008 edition of the CEOS Earth Observation Handbook; and,
- A special initiative, entitled "Data and Earth observation democracy for developing countries".

On the special topic, CSIR would like to build on the INPE and China CBERS data initiative to explore broadened data democracy for developing countries. CSIR has had initial discussions with EUMETSAT for use of GEONETCAST for that purpose. Pontsho proposed that CEOS use the WG outputs to strengthen the capacity of the users to develop applications and cautioned that as we work through the GEO WP tasks – we need to ensure that the impact is felt at the local level – including in developing countries. Everything needs to be transferred into societal benefits.

Pontsho Maruping thanked the outgoing CEOS management: Barb Ryan (Chair), Volker Liebig (SIT Chair), Jean-Louis Fellous (CEOS Executive Officer), Ivan Petiteville (WGISS Chair), Yolanda Berenguer (WGEdu Chair), and Changyong Cao (WGCV Chair). And she encouraged all CEOS Members to participate in the 22nd Plenary planned for the week of 10th November at the Fancourt Hotel in George on the Garden Route on South Africa's southern coast.

25 2005-2007 SIT Chair Concluding Remarks

Volker Liebig (ESA/ outgoing SIT Chair) gave some concluding remarks to seal his Chairmanship of SIT:

- The game has changed for space agency coordination efforts with the advent of GEO: it represents an important opportunity for the potential of EO to provide real societal benefits to be recognised politically and internationally;
- CEOS has laid claim to GEOSS space segment implementation and commitments by agencies have to follow;
- The SIT strategy for 2005-2007 has been to apply substantial investment in the foundations for consistent and action-oriented approach to the GEOSS space segment targets (The CEOS Implementation Plan) - moving Plenary to action-oriented agenda and broadening participation and resources applied to CEOS activities (all major space agencies); whilst simultaneously pushing on narrow fronts with the Virtual Constellations, recognising political attention spans are short and seeking very specific implementation outcomes that CEOS can claim. Both thrusts need refinement and resources to fulfil their potential;
- The CEOS-GEOSEC annual dialogue cycle needs to be formalised; a strong GEO is critical for our success, collectively & individually.

Volker Liebig hoped that GEO would provide a continued focus on its unique access to political support for Earth observation, and support CEOS and others to focus on the detail of implementation. CEOS has the framework in place in 2007 to allow all its members to focus on implementation progress for the GEOSS space segment. Principals and agencies must decide whether to properly engage or not.

He wished good luck to Mary Kicza & the NOAA SIT Team and to Pontsho Maruping & the CSIR Team for their leadership of the community in 2008. He also congratulated the CEOS SEC – noting that the SEC is what drives CEOS. Volker thanked the ESA team for its outstanding work, and expressed his gratitude to Stephen Briggs for his leadership.

26 2007-2009 CEOS SIT Chair Goals

Mary Kicza (NOAA/incoming SIT Chair) stressed that she is looking for a collective effort over the coming 2 years by all CEOS agencies engaged in the GEOSS implementation. She stressed three specific goals:

- Strengthen CEOS Linkages to GEO and GEOSS: including improvement of the IP to create version 2.0 in 2008;
- Advance the Virtual Constellations initiative, including: pursuit of the actions identified by the pilots, implement new Constellations as they are called for; clarification of the roles and responsibilities of the SEO;
- Align SIT structure to support these efforts: stronger emphasis by SIT on implementing and communicating CEOS contributions to SBAs; monthly tag-up with CEOS Executive Officer and CEOS Working Group Chairs; monthly tag-up and progress report to CEOS Chair

(CSIR; GISTDA in 2009); quarterly meetings with Constellation Leads; quarterly reporting to the GEO Secretariat.

Mary expects to have an action-focused *tour de table* at SIT-21 and SIT will work to quickly circulate a summary of each agency's requested commitments. She also will seek to keep the entire community better informed and will contemplate a monthly email of a SIT report to keep people updated.

Action			
	21-24	**SIT Chair to consider distributing regular email updates on GEOSS Space Segment implementation progress so that the entire CEOS community is engaged throughout the year**	**CEOS-22**

27 Chair Handover

In handing over the Chair to Pontsho Maruping of CSIR, Barbara Ryan stressed that the CEOS IP work is absolutely critical – and the 21st Plenary has been energising to hear the degree of support from Principals. Much has been accomplished in pushing CEOS towards a business approach, but CEOS needs to continue to "raise the bar". Is CEOS able to show its capability to connect its members' systems and data and provide services for informed decision-making? Can CEOS demonstrate that it is ready to start implementation? Can CEOS members clearly and concisely define what is needed for the future for continuity of services? Barbara noted that these tasks all imply added responsibility, but closed with Churchill's admonition that 'responsibility is the price of greatness'.

Volker Liebig (ESA) thanked Barbara and her team for their amazing leadership of CEOS in 2007.

Pontsho Maruping adjourned the meeting.

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CONAE	Ana Medico
CONAE	Conrado Varotto
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CSA	Savinder Sachdev
CSIR	Alex Fortescue
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WGISS/ESA	Ivan Petiteville
WMO	Jerome Lafeuille

2008 actions and commitments		
Relevant GEO targets or WP tasks	Action	Lead agency / WG & contributors nominated
Disasters		
1 Strengthen Int'l Charter	Study of improved EO mission tasking and scheduling interoperability also with non EO data, such as volcanic or flood forecasts. EO data mining scenarios, derived from charter procedures, should be made publicly available and implemented. The Charter data catalogue should be made publicly available on the web. Continue capacity building and implement the "regional project manager" concept in other regions (e.g. Asia, Africa).	ESA & Charter Team
7 Study INSAR integration for disaster warning & 110b Integrated INSAR & GPS system	Implement a 2008 workshop on integration of in-situ and InSAR data.	DI-06-9 steering group (this is a new commitment to fill the leadership vacuum on INSAR which was apparent in 2007 progress)
108 Lidar/INSAR topography	Study feasibility of provision of high vertical resolution (less than 1 metre) topographic data to be made available for at-risk low relief and coastal areas, plus good shallow-water bathymetry.	DI-06-9 steering group (this is a new commitment to fill the leadership vacuum on INSAR which was apparent in 2007 progress)
110a Critical obs. continuity for risk mgt	Develop a long-term implementation plan for on-going observations for CEOS review – in coordination with efforts to study a CEOS Virtual Constellation for Disasters (assuming the study is approved by CEOS to proceed)	SIT Chair CSA
111 Automated satellite data processing systems for rapid hazard detection	Study of how to broaden ongoing initiatives towards target 111 in terms of coverage, user community and data interoperability (fire monitoring and oil spill detection etc are not covered currently by task DI-06-04)	Disasters SBA Coordinator
Health		
	2008 actions and priorities need to be examined and defined by the proposed Health SBA coordinator	Health SBA Coordinator
Energy		
132 Evaluation and revision of strategic plan	Ensure space segment representation in the planning workshops and conference sessions to be planned for 2008 and beyond to guide implementation and assess end-user needs. As recommended in the Energy Strategic Plan, analyses of nation's space-borne measurement and modelling assets and decision support systems relevant to the energy community should be performed by other nations. It is recommended that such studies be conducted by China (NRSCC), India (ISRO), Japan (JAXA), Russia (ROSHYDROMET), South Africa (SAC), and other interested nations or	Energy SBA Coordinator ESA ISRO JAXA NRSCC ROSHYDROMET CSIR/SAC

	regions.	
134 New energy-tailored products and services	Ensure space segment representation in the Community of Practice efforts. Advocate stakeholders workshops, which bring together scientists and public/private sector end-users, to communicate the availability of space-borne measurements relevant to the energy community and to better understand user requirements. There are concerns relating to the stability of funding for further pilot and demonstration projects. National and regional funding bodies (research and operational agencies) currently provide the majority of support for these projects. Long-term commitments to GEOSS and CEOS objectives need to be articulated by these agencies to ensure continuing progress in GEO work plan goals. Non-traditional funding sources, eg, from the private sector, should be explored, as appropriate.	Energy SBA Coordinator Energy SBA Coordinator Energy SBA Coordinator
Climate		
Climate – 1st Priority thematic actions	A-3, A-4, A-5, A-6, A-7, A-8, A-9, O-1, O-2, O-4, O-5, O-6, T-1, T-4	Designated Climate Action Teams, in liaison with Climate SBA Coordinator (to be designated)
Climate 2nd and 3rd Priority Actions	All 2nd and 3rd Priority actions related to Atmosphere, Ocean, and Terrestrial domains, or Cross-cutting	Climate SBA Coordinator (to be designated)
Climate-C-1	Review the prevailing institutional arrangements in place for the planning and implementation of cooperative efforts by space agencies in the domain of Climate (among others) by 2007	NOAA
Climate-C-4	Adequate adherence to the GCMPs – study of measures for collective and individual agency efforts, including via the Constellations	CSIR (CEOS Chair)
Climate-C-16	Consider, in the context of the Constellations, ways and means to support the transfer of demonstrated observations from research satellites into operational capabilities. In particular, CEOS will encourage "convergence" of climate-observing requirements (usually for high-quality data) with operational requirements (usually for rapid and ensured data availability), and support institutional arrangements that would help transfer ECVs from research to operations).	NOAA (SIT Chair)
Climate-C-20	CEOS agencies will endeavour to ensure global, easy, and timely access to climate-related products, including by developing countries: proposed that this action be championed by GISTDA as incoming Chair in 2008 and by EUMETSAT, supported by CEOS, SIT, and WGEdu Chairs, as part of a broader initiative towards GEO 2-year target #29 (Improve the reporting of observations to international data and analysis centers in terms of data volumes, quality and timeliness) and in relation with the R/SSC-CM initiative. It is further recognized that CEOS could do more to better engage all its members, notably from China, India, and Russia, in its Response to the GCOS IP and seek to have their substantial archives and satellite missions of value to climate applications recognized by and accessible to the international community. It is proposed that CEOS Chair and SIT Chair devote a special effort to that important goal.	GISTDA (Lead) EUMETSAT CEOS Chair SIT Chair WGEdu CEOS Chair SIT Chair
Climate-C-21	Documenting access arrangements for space agency	WGISS

	contributed FCDRs	
Water		
44 Plan for 3 hourly global precipitation products	Continued support for addition of data from NOAA-N AMSU and Metop-A AMSU to the 3B42 efforts is required.	NOAA & EUMETSAT
46 Study sat.capabilites for surface water quality & mapping aqua habitats	Development of a pilot project in either/both the Americas and SE Asia.	TBD
43 Implementation plan for water cycle data integration system & 146 Test a fully integrated prototype data system with assimilation, analysis & visualization	CEOS space agencies should support the challenge of CEOP's integration of 7 RHPs by providing satellite data and supporting the data integration. Continued development of WGISS Test Facility	JAXA lead WGISS
45 Integrated precip. And soil moisture products	Support to build a soil moisture gridded dataset is necessary. Access to suitable soil moisture data and products from space and terrestrial observations is necessary.	TBD
156 GPM & Mission for surface & subsurface water stores	The CEOS Precipitation Constellation (DA-07-03) should further expand the original GPM concept, by incorporating new missions and instruments. CEOS space agencies should support the CEOS Precipitation Constellation.	Precipitation Constellation CEOS Members with supporting precipitation payload plans
142 Produce new products for precip., soil moisture, evaporation, evapotranspiration & other water cycle variable	A new CEOS-led task is required to fill the gap in the GEO Work Plan	Precipitation Constellation?
WA-2yr-1: Collaborative mechanism between observational and research communities	Advocate continuation of IGWCO within GEOSS for coordinating all the relevant programmes for water cycle research and applications	CEOS Chair and SIT Chair
Weather		
	Weather SBA actions are coordinated with CGMS and WMO Programmes and not reported by CEOS	
Ecosystems		
59 Implement IGOS Carbon Observing	1. Development and implementation of a strategic plan for global CO, CO2 and CH4 satellite obs combining existing measurements (MOPPITT, AIRS,	TBD

System	SCHIAMACHY, IASI) with OCO and GOSAT, including coordination of calibration and validation network. 2. Continuity and expansion of coordinated in situ and satellite observations over ocean through IOCCP 3. Expansion of fluxnet network to give better geographical and land cover coverage and its coordination with cal-val networks in support of satellite land surface observations (CEOS WGCV LPV). 4. Rigorous sensitivity analyses for global land surface products from satellites (LAI, phenology, fAPAR, burned area). 5. There is a need for overarching body to implement the Global Carbon Observatory whose responsibility would be to improve coordination between existing international programmes and components, particularly GCP, TCO, IOCCP, IGCO and GEO, to coordinate and improve links between the carbon cycle research community and the traditional weather forecasting centres and facilitate communication between in situ & remote sensing communities.	TBD WGCV TBD
61 Continuity of moderate to high-resolution EO satellites for Land cover & ocean colour	1. Refine and expand preliminary mid-resolution LSI system standards (6/08) 2. Accomplishment of LSI constellation goals and objectives, including those related to continuity of moderate to high-resolution EO satellites for Land cover require contribution of meaningful personnel resources from the CEOS space agencies that operate LSI systems.	LSI Constellation Team LSI Constellation Team Agencies operating or planning moderate to high-resn land imaging assets
Agriculture		
73 Basis for continuity of hi-res satellites 173 Continuity of high-resolution imagery for monitoring logging	LSI Constellations is largely addressing the continuity issue, but continued emphasis is necessary. Moderate resolution continuity is currently a Priority 2 Action for the CEOS response to the GCOS-IP. This could be elevated to a Priority 1 Action and more actively address several of the GEOSS Agriculture SBA targets (69, 74, 171, 174). Several CEOS agencies are already addressing this issue and could make substantial progress in the near-term (EUMETSAT, NASA, USGS, NOAA, CSA). In the first instance the LSI Constellation might investigate and propose a way forward to cover the necessary ground (action: LSI Constellation Team).	LSI Constellation Team
Various	CEOS representation to the relevant IGOL and GOFC/GOLD workshops is necessary in 2008 to maintain awareness of evolving user needs and of progress towards them.	Agriculture SBA coordinator
Biodiversity		
Cross-cutting		
98 Freq. Protection (AR-06-11)	The Radio Frequency issue (AR-06-11) will require a continuous effort to increase the awareness of the competent authorities and to maintain the pressure and lobbying at the right level	ESA (Marelli)
AR-07-01 Interoperability arrangements	Both CEOS WGISS (ICS Catalog Task Team led by ESA, Archive Task Team led by JAXA and Data Services Task Team led by USGS) and the CEOS	WGISS

	Members that host data catalogues, data archives and other information servers have to follow closely the recommendations made by the AR-07-01 Task Team for what concerns interoperability matters. It is expected that at least the following space data providers (CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS) allocate the necessary resources to the three WGISS Task Teams mentioned above.	CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS
DA-06-01 Data sharing principles	• CEOS to carefully review the White Paper in coming months. The GEO Secretariat intends to have the document be endorsed in 2008 by GEO Members & Participating Org. • Active participation of CEOS members to be continued / increased (currently limited to WGISS)	SIT Chair
DA-06-04 Data, metadata & product harmonisation	The task DA-06-04 dealing with "data, metadata and product harmonization" is expected to really start in 2008. CEOS Agencies having a long experience in the matter will have to participate actively either directly or via WGISS. The same Agencies as the ones listed for task AR-07-01 (CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS) are requested to allocate some experts in 2008.	WGISS Coordination CNES, DLR, ESA, EUMETSAT, JAXA, NASA, NOAA, USGS
CB-07-02 Knowledge sharing for improved disaster management & emergency response	Inputs from all CEOS agencies will be solicited in 2008 for the development of the knowledge portal on disaster management.	WGEdu UNOOSA, UNESCO

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Final

21st CEOS Plenary Actions

No.	Action	Due Date
21-1	CEOS Chair to send letters confirming CDTI and CRESDA as the newest Members of CEOS	December 2007
21-2	SIT Chair and CEOS Exec Officer to confirm volunteers for SBA Coordinator roles and to establish their function in the CEOS IP update and management in 2008	December 2007
21-3	CEOS contact persons for all GEO WP tasks encouraged to regularly report progress through their Task Leaders in 2008 with tracking of this process by the CEO	CEOS-22
21-4	CEOS agencies which have not yet designated a climate actions focal point to provide the contact information to the CEOS Executive Officer and Climate SBA coordinator Mitch Goldberg (NOAA)	January 2008
21-5	DLR to provide CEOS Chair with a letter regarding adherence of their planned EO missions to the GCOS Climate Monitoring Principles	January 2008
21-6	SIT Chair (supported by CEOS SBA Coordinators) to oversee and promote implementation of the CEOS IP priority actions (across all SBAs and cross-cutting) defined for 2008 [the draft priority actions are annexed to Plenary minutes]	CEOS-22
21-7	In relation to Action 21-6, SIT Chair (supported by SBA Coordinators and GEOSEC) to first refine and revise the 2008 priority actions as part of an early analysis of the gaps and inconsistencies in the IP V1.0 to plan its update and improvements in 2008	February 2008
21-8	SIT Chair, in liaison with GEOSEC, to develop the refined list of GEOSS space segment implementation priorities – as the basis for a tour de table at SIT-21	SIT-21
21-9	CEOS Executive Officer to liaise with GEOSEC to ensure formal feedback on the envisaged CEOS IP V2.0 ahead of 22nd CEOS Plenary	CEOS-22
21-10	GEOSEC to convey request of OST Constellation team to GEO Co-Chair from China for engagement of the China State Oceanic Administration in the Constellation efforts	December 2007
21-11	SIT Chair to engage CEOS Principals to help address the implementation actions identified by the 4 Pilot Constellations	SIT-21
21-12	SIT Chair, supported by Pilot leads, the CEO, the SEO, and GEOSEC, to undertake a review of the Constellations	SIT-21

	framework and supporting documentation in time for discussion at SIT-21. This should include: consideration of whether further studies should be invited and on what topics; and consensus on the role for the SEO.	
21-13	CEOS Executive Officer to investigate the possibility of establishing a simple on-line information system which could assist in monitoring and managing GEO WP tasks	CEOS-22
21-14	CEOS Executive Officer to liaise with SIT Chair, WG Chairs and GEOSEC to identify priority WG initiatives on which GEOSEC might assist with appeals for resources	March 2008
21-15	Gilberto Camera to provide CEOS Chair with the web address of the Brazil Landsat free archive	December 2007
21-16	In response to WGCV request, CEOS and SIT Chairs to explore mechanisms for improved coordination on benchmark measurement missions (climate action A-5)	SIT-21
21-17	In connection with transition of IGOS Themes to GEO, CEOS Agencies urged to continue their support of IGOS Theme Team Leads and members within their organization to enable IGOS Theme contributions to continue within GEO	CEOS-22
21-18	CEOS Chair to implement Plenary decisions on improved coordination with CGMS and WMO Space – including arranging an annual meeting and a representative on the R/SSC-CM Executive Panel	CEOS-22
21-19	CEOS agencies encouraged to support ESA's anticipated requests in support of the new edition of the CEOS Handbook and the associated database.	CEOS-22
21-20	SIT Chair to develop the proposals on commercial sector engagement including a response (from CEOS Chair in the near future) to the letters from Alliance for Earth Observations and EARSC – starting with quick circulation of draft TORs for the small task force proposed	SIT-21
21-21	CEOS agencies urged to return the frequency protection questionnaire to BNSC	December 2007
21-22	CEOS Chair to confer with BNSC and Edoardo Marelli to investigate the possibility of a CEOS note for agencies to provide to national reps to ITU on frequency protection for Earth observation.	December 2007
21-23	CEOS Chair to confirm acceptance in writing of INPE's offer to serve as Chair for 2010; and CEOS SEC to confirm CEOS Chair candidates for 2011	CEOS-22
21-24	SIT Chair to consider distributing regular email updates on GEOSS Space Segment implementation progress so that the entire CEOS community is engaged throughout the year	CEOS-22

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Monday, November 12

**	NESDIS Morning Tag-Up	8:30 – 9:00	Hamakua
	CEOS Troika/Working Group Leaders Meeting **(This is a tag-up that brings Troika Chairs and WG Chairs together; per USGS agenda, meeting focuses on resources WG's and CEOS Agencies can bring to bear and how WG's can support GEO and GCOS. NASA SEO is also being addressed. SIT is not technically a WG but a team comprising CEOS Agencies at Principal level. We need to speak up on issues that impact SIT.)**	9:00 – 10:00	Puna Room
	CEOS SEC-108 **(USGS chairs. Stephen Ward, with his USGS hat, has set the agenda. Focus will be on ensuring that everything is set for the Plenary.)**	10:15 – 11:15	Puna Room
	GEOSEC – CEOS Chair/SIT Chair Meeting on GEOSS Space Segment Implementation **(Agenda drafted by us and Mike Rast. USGS and ESA may presume they are chairing this meeting; we need to assure that our points are made on each agenda item.)**	1:00 – 3:00	Puna Room
	Early Plenary Registration	3:00 – 5:00	Lanai

Tuesday, November 13 (Ballroom)

(General guidance to all plenary presenters: Synthesize your reporting into the following topics: (1) past accomplishments (2) current/future challenges, and (3) requested agency commitments. Emphasis should be on the latter two topics.)

**	NESDIS Morning Tag-Up	7:00 – 7:30	Hamakua
	CEOS Participants Breakfast and Registration	7:30 – 9:00	Lanai
Welcome and Opening Session			Ballroom
1	Welcome and Opening Remarks *CEOS Chair, Barbara J. Ryan* *U.S. Deputy Secretary of the Interior, The Honorable Lynn Scarlett* *USGS Director, Mark Myers* **(No NOAA remarks necessary)**	9:00 – 9:35	
2	Earth Observation Mission Cooperation (CSIRO) *Briefing on CSIRO's use of a variety of Earth observation missions to provide societal benefits to Australia.* **(Can comment, compliment CSIRO on presentation: NOAA is engaged in corals activities with Australian agencies under University of Queensland agreement.)**	9:35 – 9:50	
3	Earth Observation Mission Development (DLR) *Briefing advanced new DLR satellite technology and its benefits to the global user community.* **(Can comment, compliment DLR on presentation: DLR is launching a number of key SAR missions this year; is developing LIDAR, and aspires to have German industry develop a follow-on Jason bus.)**	9:50 – 10:05	
4	Visualization Demonstration: Virtual Constellations for GEO (USGS) *Display of five-minute video, which will run at the CEOS exhibit during the GEO Plenary and Ministerial meetings in Cape Town, South Africa. A more detailed, longer version of the video on the Virtual Constellations may be viewed by participants at their convenience outside of the meeting room.* **(Stan Wilson and JPL have made inputs on behalf of Ocean Surface**	10:05 – 10:15	

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	Topography Constellation for this visualization demonstration.)		
BREAK and GROUP PICTURE ***(business attire requested for the photo)***		**10:15 – 10:45**	**TBC**
5	Report from the Chair: Accomplishments and Challenges (USGS) *Review of the progress of CEOS against the Chair's objectives for 2007* • **I would like to compliment Barb and her USGS team for their tremendous effort in chairing CEOS this year and for planning the Plenary in such a lovely setting.**	10:45 – 11:00	Ballroom
6	Organizational Matters and Membership (USGS, CDTI, CRESDA) *Review the structure and operation of CEOS in relation to its goals and objectives, particularly with respect to GEO and the GCOS Implementation Plan. Discuss and decide upon membership request from the Center for the Development of Industrial Technology (CDTI) of Spain as well as the Center for Resource Satellite Data and Applications (CRESDA).* • **It is important that the CEOS SIT and individual CEOS agencies continue to focus not only on GEO but also on the Global Climate Observing System.** • **NOAA supports CEOS membership for CDTI and CRESDA.**	11:00 – 11:15	
7	Coordination of Open Action Items from 20th Plenary (USGS) *Discussion and decision on any incomplete actions from the 20th Plenary. Completed actions will be reported on prior to the Plenary, but will not be discussed during the meeting.*	11:15 – 11:25	
Transitioning to Action for GEO			
8	1st Annual Report on CEOS Implementation of the GEOSS Space Segment (ESA) *Review of the first version of the CEOS Implementation Plan, of the targets and tasks for which it is comprised and agreement on the priorities for 2008 and beyond, including refinements to the management process. Activity in each of the SBAs will be addressed.* • **This is impressive work. As we see, much work has been done by CEOS Agencies, particularly in the Climate area. We can learn a great deal from this effort. Having CEOS focus more intently on GEOSS SBAs, as the SIT Chair is recommending, should help.**		
8.1	• Overview (ESA)	11:25 – 11:45	Ballroom
8.2	• 2007 Progress Review & 2008 Actions (ESA) • **I am prepared as the incoming SIT Chair to help SIT and CEOS focus on addressing GEOSS Tasks and Targets. An SBA focus within CEOS should certainly help. We need to work directly with Michael Rast and his GEO Secretariat colleagues.** • NOAA is prepared to provide Mitch Goldberg as a Climate SBA focal point.	11:45 – 12:00	
LUNCH		**12:00 – 1:00**	**Canoe House**
Transitioning to Action for GEO *(continued)*			
8.2	• 2007 Progress Review & 2008 Actions (ESA) *(continued)*	1:00 – 2:15	Ballroom
8.3	• Way Forward on the IP (ESA)	2:15 – 2:45	
BREAK		**2:45 – 3:15**	**Lanai**
9	Virtual Constellations: Progress to Date and Pilot Reports (Theme Leads) *The CEOS Virtual Constellations for GEOSS was proposed as a concept early in ESA's SIT Chairmanship term, in early 2006, and has since developed to see the launch of 4 pilot studies. This agenda item will hear progress reports from each of those 4 pilots, as well as input from the SEO team of NASA, and a [illegible]*		Ballroom

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	forward for the process offered by the SIT Chair. **(ESA (Liebig or Stephen Ward as the presenter) will invite Mary to speak with regard to the interviews of Constellation Team Leads that she conducted---suggested talking points to be delivered here with regard to the interview process, with other talking points that could be added at this point or in the wrapup to the Constellation discussion.)** **----I am very impressed by the amount of work that has gone into the conceptualization and development of Virtual Constellations within CEOS.** **----In the first part of November, Stephen Briggs and I conducted interviews with the Leads of each of the 4 Constellations. We addressed a common set of questions to each Constellation.** **----We reviewed the "next steps" in each Constellation's plans for implementation and identified what SIT could do to better support Constellation activities.** **----As could be expected, we learned from these interviews that each Constellation is unique and at a different level in terms of maturity.** **----We identified issues to be worked and specifically addressed with each Constellation what CEOS and SIT could do to assist them. We and the Constellation Leads are in the process of working these issues.** **----I propose that the SIT Chair conduct a quarterly tag-up with Constellation Leads, linked with the GEO requirement for periodic reports.** **----As we discussed at the SIT meeting in Frascati, CEOS should develop a process for implementing new Constellations. I would propose that the Plenary give SIT an action to develop such a process, utilizing lessons learned thus far, and identifying candidate new Virtual Constellations.** **----Together with the GEO Secretariat we have identified both Ocean Color and Disasters as potential new Constellations. I would propose that the Plenary direct SIT to work directly with proponents of these two communities to address the viability of adding them as candidate Constellations in advance of the April 2008 SIT meeting.**	
9.1	Atmospheric Composition (E.Hilsenrath, J. Langen) (Probably best for Mary to give collective general comments on all Constellations at one time but she should be prepared to speak up if presenter makes reference to Interview or engages her in discussion.)	3:15 – 3:25
9.2	Global Precipitation (R. Oki, S. Neeck)	3:25 – 3:35
9.3	Land Surface Imaging (B. Bailey, V. Jayaraman)	3:35 – 3:45
9.4	Ocean Surface Topography (F. Parisot, S. Wilson)	3:45 – 3:55
9.5	Requirements Analysis and Systems Engineering (NASA) • **SEO involvement can be very helpful to those Constellations (like ACC) who have requested it.**	3:55 – 4:10
9.6	Way Forward (ESA) **(see above set of Constellation talking points)**	4:10 – 4:20
9.7	Summary *A brief recap before the GEOSEC feedback and Principals discussions of the ground covered by the IP effort (including Constellations in 2007) and of the way forward proposed for 2008 and beyond.* (see above set of Constellation talking points)	4:20 – 4:30
10	GEO Feedback on CEOS Progress and Future Coordination (GEO) *GEO Secretariat comments on the scope, applicability, and status of the CEOS Implementation Plan for the GEOSS Space Segment. Discussion of means to ensure close coordination and dialogue between GEO and CEOS in the coming year.*	4:30 – 5:00

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	(Mike Rast will be making this presentation---hopefully consistent with our ongoing discussions with him and leading to a reanalysis/second mapping exercise with CEOS; greater CEOS involvement on GEO committees (Transverse Areas)		
11	Dialogue on CEOS Implementation of GEOSS Space Segments (CEOS Principals) *Discussion and decision among CEOS Principals of member agencies' commitment to provide staff and resources to implement the GEOSS Space Segment.* • NOAA is prepared to step up to leadership of the SIT, working directly with GEO Secretariat, the CEOS Executive Officer and other CEOS Agencies (in close consultation with the CEOS Chair) to implement CEOS contributions to the GEOSS Space Segment.	5:00 – 5:30	
WELCOME RECEPTION — CEOS PARTICIPANTS		**6:30 – 8:30**	**Milo Tree Lawn Area**

Wednesday, November 14

**	**NESDIS Morning Tag-Up**	**7:00 – 7:30**	**Hamakua**
CEOS Participants Breakfast and Registration		**7:30 – 9:00**	**Lanai**
Organizational Development and Work Plan Implementation			Ballroom
12	CEOS Executive Officer Report (J.-L. Fellous) *Report on Executive Officer's 2007 activities and achievements 2007, current and future challenges, and resources required to address them. Perspectives on the value of the position to achieve CEOS objectives.* • We very much appreciate the effort undertaken by Jean-Louis Fellous this past year, and wish him well as he moves on to COSPAR duties. We look forward to working with Ivan Petiteville as CEOS Executive Officer.	9:00 – 9:15	
13	WGISS Report and Actions (I. Petiteville) *2007 accomplishments, current and future challenges, and requested commitments from CEOS members to further the objectives of WGISS.* • Ken McDonald to provide inputs	9:15 – 9:30	
14	WGCal/Val Report and Actions (C.Cao) *2007 accomplishments, current and future challenges, and requested commitments from CEOS members to further the objectives of WG Cal/Val.* • Changyong to provide inputs	9:30 – 9:45	
15	WGEdu Report and Actions (Y. Berenguer) *2007 accomplishments, current and future challenges, and requested commitments from CEOS members to further the objectives of WGEdu* • Renee to provide inputs?	9:45 – 10:00	
16	IGOS-P Coordination and GEO Transition Issues (USGS, UNESCO, GEO) *Report from IGOS Co-Chairs on the recommended transition of IGOS Themes into GEO, discussion of current issues/challenges, and decision among CEOS membership on the proposed transition process.* • Brent Smith to provide inputs	10:00 – 10:15	
17	Review/Approval of CEOS Input to the GEO Plenary and Ministerial Summit *Discussion of CEOS report to these two meetings (provided in writing advance of the CEOS Plenary), and approval of final CEOS report* (Unclear who is drafting this material. As incoming SIT Chair, representing	10:15 – 10:45	

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	CEOS as Cape Town meetings, it is important that you, and of course Pontsho, approve this material. It should also be blessed by Plenary. We may have to craft it, or suggest changes, on the spot.		
BREAK		**10:45 – 11:00**	**Lanai**
18	CEOS, CGMS, and WMO Coordination and Support to GEO (USGS, EUMETSAT, WMO) *Unified presentation on the past year's coordination efforts, and recommendations for continued cooperation in support of GEO and user community objectives.* • **NOAA welcomes the progress that has been made this year in addressing closer cooperation among these three coordination mechanisms. NOAA is an active participant in each.**	11:00 – 11:30	Ballroom
19	CEOS Publications and Outreach (JAXA) *Report on newsletter, updated web site, and related outreach and communications efforts.* • We compliment **JAXA on the outstanding work they have done in issuing the CEOS newsletters and CEOS and IGOS brochures.**	11:30 – 11:40	
20	CEOS and the Commercial Sector (BNSC) *Report on the past year's efforts to analyze possible further CEOS interaction and coordination with the commercial sector. Discussion and decision among Plenary participants on next steps in CEOS-level dialogue with the commercial sector.* • **I agree on the need to work for closer CEOS interaction with the commercial sector. It is important through some type of process** (similar to what **we call a RFI process) for CEOS to be able to be** responsive to	11:40 – 12:00	
LUNCH		**12:00 – 12:45**	**Canoe House**
	Keynote: Dr. Shawana Johnson – President, Global Marketing Insights	**12:45 – 1:15**	**Ballroom**
The Way Forward			
21	Radio Frequency Coordination Matters (BNSC) *Presentation on recent developments with the coordination of radio frequency matters, its impact on CEOS members' system operations, and steps for further liaison/coordination with national administrations, international working groups, and the International Telecommunications Union (ITU).* (Have asked David McGinnis/OSD and Al Powell to provide us with an update on NOAA positions on radio frequency coordination matters)	1:15 – 1:30	Ballroom
22	Calendar November 2007 – November 2008 (USGS) *Discussion of CEOS-level meetings for the upcoming year, and other meetings of general interest to CEOS members.* (April and September **SIT meetings should be noted on this calendar, still** as "proposed." We **should indicate that we have coordinated these dates** with the incoming **CEOS Chair and with our SIT Vice-Chair, Dr. Horikawa,** and we propose that **these dates be entered into CEOS delegates individual** calendars.)	1:30 – 1:40	Ballroom
23	Future Chairmanship (USGS) *Discussion and decision by Plenary participants on the 2009-2010 and 2010-2011 CEOS Chairs.* • **We look forward to working with the CSIR, GISTDA and INPE future** chairs.	1:40 – 1:45	
24	2007 CEOS Chair Vision (CSIR) *Report on the new Chair's objectives and priorities for the upcoming year. Related discussion on support from CEOS member agencies.* **We look forward to working closely with Pontsho Maruping (planning**	1:45 – 2:00	

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	monthly tag-ups)		
25	2005-2007 SIT Chair Concluding Remarks (ESA) *Concluding remarks and observations by outgoing SIT Chair.* • **We want to express our appreciation for the work that Volker Liebig and Stephen Briggs have done in leading the SIT over the last two years.**	2:00 – 2:15	
26	2007-2008 CEOS SIT Chair Goals (NOAA) *Report on new SIT Chair's objectives and priorities for the upcoming two years. Related discussion on support from CEOS member agencies.* Mary Kicza presentation	2:15 – 2:30	
27	Review of Members' Commitments and Action Items (USGS) *Review and discussion of CEOS members' commitments to the following: The CEOS Implementation Plan for the GEOSS Space Segment, implementation of the CEOS Virtual Constellations, the CEOS response to the GCOS Implementation Plan, and further support of CEOS Working Groups.* **(We need to ensure that there are key actions adopted by the Plenary that further the work of SIT; address a process for new Constellations; work a reanalysis/remapping effort with GEO Sec; inaugurate SBA focal points within CEOS; etc.**	2:30 – 2:40	
28	Chair Handover (USGS) *Recognition of South Africa's Department of Science and Technology as the 2007-2008 CEOS Chair.* • **Thanks to Barb Ryan; congratulate Pontsho Maruping**	2:40 – 2:45	
ADJOURN		**2:45**	

• CEOS SEC Meeting (Agenda to be provided by Stephen Ward; Pontsho will chair the meeting; Stephen Ward's Work Plan will be addressed)	3:00 – 4:00	Puna Room
CEOS SIT Organizing Team Meeting (Notice has been sent out to all expected participants with an agenda promised during the course of the Plenary.)	4:15 – 5:15	Puna Room
CLOSING DINNER — CEOS PARTICIPANTS **Open Seating**	**7:00 – 9:00**	**Poolside Area**

Thursday, November 15

21st CEOS PLENARY ASSOCIATED EVENT: Technical Tour USGS Hawaii Volcano Observatory, and Hawaii Volcanoes National Park • **Enjoy the visit to the volcano**	7:45 am – 6:30 pm	Hotel Entrance